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Exhibitions.

IT seems probable that before long the electrical industry may once again have its attention directed to the question of exhibitions, for it was recently announced that the Electrical Development Association, through its Exhibition Sub-Committee, was exploring the possibility of organising a national exhibition—whatever that may mean—and was clearly arranging to participate in an exhibition at Newcastle.

A short time ago we went into this subject very exhaustively in these columns, and a good deal of discussion has taken place in various quarters since then.

There is little need to allow the subject of local efforts to hamper our examination of the matter, for these have proved beyond all question, we think, that they possess a real business-getting and educational value for electricity suppliers and for dealers in appliances. Wherever there is scope for domestic or industrial load development, with fairly cheap electricity available, periodical exhibitions, and perhaps permanent showroom displays, are desirable. Another class of exhibition that need not trouble us, though for a very different reason, is the long general exhibition (five or six months' run) with an electrical or engineering section, such as were held in pre-war days, and are regarded as worth while by only a few firms. These, probably, the industry, if it acted as an organised body, would, unless the circumstances were quite exceptional, quickly rule out as not worth the money, trouble and weariness involved. The British Empire Exhibition was a patriotic and very costly effort in a class by itself, and enthusiasm would not be worked up for a repetition on such a scale at an early date, even were there any occasion for holding it.

Exhibitions of a shorter duration at home, in the Dominions, and in some foreign markets will demand fuller consideration. One annual event of this kind is well-established amongst us—we refer to the British Industries Fair, London and Birmingham—and we hope that for many years it will continue to grow in character and scope until it becomes completely representative of British productivity. It is a short-run, live market show, an excellent opportunity for both foreign and home trade. We anticipate a bigger success than ever in the electrical section at Castle Bromwich in February-March, 1929, for its popularity is increasing from year to year, though it is thought by some that exhibitors are nowadays inclined to take larger spaces than were contemplated a year or two ago. We hope that the Fair will include many small trade-counter exhibits.

There is sometimes a thought that the Ideal Home

electrical features might receive a little less attention and that a short, purely electrical exhibition might be held at Olympia or other suitable place suitable for an impressive display calculated to appeal to the public fancy; an exhibition organised in such a way, on such a scale, and with such attractiveness, as no local affair could find practicable—a big Autumn Electrical Fair where all varieties and forms of electrical illumination, attractions and allurements that have become available since the last big London show could be demonstrated—would appeal to the eight million inhabitants of our great area.

Apparently there is a very definite desire not to participate as industries in long international exhibitions such as were held at Milan, Ghent, and so on, for at the International Exhibitions Conference held in Paris last week a convention was signed by official representatives of Government Departments and Chambers of Commerce of this and other countries for the purpose of limiting events of this kind, whose merit lay more in the diplomatic pressure behind them than in their trade value. Short fairs such as have been held at Lyons, Leipzig, and Berlin will not be banned, but new ones of the same kind will have to be considered by a council. The Convention, in the first instance, will restrict the big international exhibitions and leave the smaller ones and Fairs for later deliberations. It is reported that it was agreed by the representatives of 39 nations present that one such exhibition should be held in each of their countries not more frequently than every 15 years.

There is, however, a class of exhibition which the electrical and allied industries might with advantage consider seriously. We refer to the comprehensive exhibition of British electrical products in various parts of the Dominions and in foreign countries, where it is so desirable that there should be greater activity—both co-operative and individualistic—in British export enterprise. The British Industries Fair affords an excellent opportunity for showing our smaller manufactures to overseas visitors who can be induced to visit England at the time the event is held, but the number of electrical and engineering visitors has never been so large as could have been wished and might have been anticipated. We need to work the Fair for all it is worth, but we ought also to enter the overseas markets and make suitable demonstrations there. If electrical manufacturers and traders were to meet together to discuss whether there is any value in this particular proposition, it might lead them on to some live-wire schemes for both mass and individual attacks upon British Empire and other overseas markets which appear to be more or less neglected at present. As we have so often suggested here, this is a way in which we can prepare sound measures for finding work to permanently reduce unemployment amongst our own kith and kin in these islands.

Trade Ambassadors: Royal and Otherwise.

At the Batti Wallahs' luncheon last week much was made by Sir Hamar Greenwood, M.P., of the visit of Mr. Hoover, the newly-elected President of the United States, to the South American ports. Whatever may be the motive originally inspiring the planning of that visit, Sir Hamar was probably right in suggesting that the United States will reap any trade benefit that results therefrom. But in our opinion the speaker, when using Mr. Hoover's activity and his imposing organisation for the purpose of stressing British inactivity, was hardly justified in leaving certain very important things out of account. Have we not a Prince of Wales and other members of the Royal Family who have travelled thousands and thousands of miles as Ambassadors from Britain? Have not Sir Hamar's successors at the head of the Department of Overseas Trade, and many other people in a position to know, paid very high tributes to these Royal representatives as overseas trade encouragers? Did not the Prince of Wales go to South America several years ago and promote better feeling—surely a good trade-getter—towards this country? We might even wonder how far Mr. Hoover's visit is a counter move after the Prince's visit! Do not their Royal Majesties the King and Queen, as well as their sons, lend valued patronage to the British Industries Fair? We do not think that the Rulers of the British Empire, our Colonial Secretary and our Australian Mission are less important than Mr. Hoover as trade promoters.

We do not wish to suggest that the electrical or any other British manufacturers are doing all that they should in trying to extend our business in South America, but there are other things besides Mr. Hoover's visit which may militate against British electrical success in that continent. It is no new matter for British and other financial interests in South American concerns to be sold for good prices to American organisations. It has been going on for years. American electrical companies always have seemed to regard South America as their particular preserve, and they have sometimes operated there through Continental companies. What steps have British electrical financiers and directors, or groups of manufacturers, taken in recent days to meet the requirements of the field competitively? We really believe that this is what Sir Hamar wants to know. It may be that his own brief experience at the Department of Overseas Trade still lingers with him. He may be reminded of the exhaustive operations of the American State Bureau and of the very restricted ones possible to the D.O.T. When Sir Hamar was at the head of the latter, expenditure was ruthlessly kept down, and since then its very existence has been threatened—indeed, its future seems to be in doubt even now. Manufacturers may well feel that the British Government ought to give them a better backing in this connection. Mr. Hoover and his staff, representing an already very prosperous people, constitute a special State Department of Foreign Intelligence. We are sure that with all his past experience Sir Hamer will make a valuable electrical director, and perhaps we may look to him as such to give a lead to manufacturers in exploiting trade possibilities in South America and throughout the British Empire if they desire it. If he can point the moral of American State activity so as to secure greater assistance from the British Government he may work a valuable miracle.

Battery Eliminator Dangers.

Long before any accident occurred through the installation of wireless receiving sets in houses where electricity was used for lighting and other purposes, we uttered a warning as to the serious possibilities that would arise if faults existed simultaneously on both sets of apparatus. Unfortunately, our prediction was verified in more than one instance, and other fatalities, we fear, will have to be recorded, soon or late. Again, when battery eliminators began to come into use, we pointed out that a new risk was thereby introduced, the converse of the former; whereas the crystal set or the battery-fed loud-speaker set introduced an efficient earth connection into the living room, the mains-fed set, insulated from earth, but quite commonly in direct connection with the supply mains, became a live wire and an unsuspected channel for communicating a fatal shock to the innocent user of it. Happily no such misfortune has yet occurred, so far as we know; but that it will come is only too probable. How great is the risk is graphically demonstrated by Mr. R. H. Rawll, an electricity supply engineer, elsewhere in this issue; the author points out that the issue of special regulations by the Institution of Electrical Engineers to cover the case, whilst entirely commendable, is wholly ineffective in many instances, because the person who constructs or installs the apparatus has never seen or heard of those regulations and is unaware of the risks to which he is unconsciously exposing himself and his household

Mr. Rawll has endeavoured, without success, to induce the B.B.C. to issue a warning from its stations; we also urged the Corporation to do so, with the like result. *By no other means* can the warning which is so urgently needed be conveyed to the people whose interests are vitally concerned, and we hope that pressure will be brought to bear upon the B.B.C. in some way or other for this purpose.

The danger is great because it is so novel and insidious. The user of electric light and heat runs little risk, because in any decent installation the chance of personal contact with live metal is remote, and in the absence of an earth connection such contact has trivial effects; but the person who has been accustomed to the use of harmless batteries and changes over to a mains supply, unless armed with expert knowledge, lives in a fool's paradise. Even if a loud-speaker is used, which is not handled when in operation, one often listens with head-'phones when tuning for distant stations—and head-'phones are often faulty; moreover, as Mr. Rawll remarks, the whole of the metal screens may be alive and liable to contact at any moment. Apart from the risk of shock, there is great danger of fire resulting from the use of lightly insulated wires at the mains pressure, trailed about the house in proximity to gas and water pipes.

A factor which lends additional weight to the warning is the practice of earthing the frames and other metallic parts of portable apparatus, which is advised by the Institution of Electrical Engineers in "all places where even a slight shock might lead to serious accident," and is advocated by many electrical contractors in all places without exception. If a person wearing live head-'phones touches the earthed frame of a radiator or the metal stand of a table lamp, a dangerous shock is certain to result. Incidentally, therefore, our objection to earthing exposed metal in living rooms is further justified. But the important thing is that the leads, head-'phones, and exposed metal of wireless receiving sets shall not be made alive; unless active steps are taken by the responsible authorities to propagate this knowledge, the consequences may be very serious.

Rural Electrification.

THE subject of electricity supply in rural areas was brought into prominence last week by the meeting of the Overhead Lines Association, at which Mr. W. A. Turnbull, electrical engineer to the Corporation of Aylesbury, read an excellent paper and initiated a lively discussion, both of which are reported in this issue; also on the same day Col. T. C. Ekin, on behalf of the Electricity Commissioners, opened an inquiry into a number of applications for powers to supply electricity in Lincolnshire, a county which is largely agricultural in character.

In both cases detailed plans were put forward for the electrification of specified rural areas. Mr. Turnbull dealt with a district of 106 square miles, thinly populated and with no industrial load, which he has minutely surveyed with a view to ascertaining the possible and probable demand; his conclusion is "that a universal supply of electricity is a profitable proposition in such an area." The author gives full particulars of the line construction contemplated and of the commercial prospects of the undertaking, which should be useful to other engineers confronted with similar problems.

With regard to the Lincolnshire inquiry, whilst the decision of the Commissioners is not yet known, we may point out that the scheme put forward in great detail on behalf of Mr. R. Borlase Matthews is of exceptional interest in many respects. This is, we believe, the first instance in which a scheme has been prepared to cover a whole county, with a view eventually to supplying all its inhabitants with electricity; it is a scheme relying wholly upon bulk supply from existing generating stations; and it has been worked out by an engineer of wide experience —Dr. Alfred Ekström—who has successfully carried out similar schemes on a large scale in Sweden, and has the reputation of being the most eminent authority on the use of electricity for agricultural purposes in Europe. Dr. Ekström regards the county of Lincolnshire as a particularly suitable one for electrification from the rural point of view, and expects, if the application is granted, to give a supply of electricity to half the rural population within three years, on terms which will be agreeable to the consumers and remunerative to the suppliers. We hope that he will have the opportunity to do it.

Electricity in Foundries.

IT is a healthy indication of progress in the foundry industry that electricity is being more and more generally adopted as a motive power for cranes and hoists, and also that the electric furnace is slowly but surely making headway for melting cast iron. The electrically-operated moulding machine has also much in its favour. It is recognised that the principal condition for the use of electricity for melting, drying, and heating furnaces is a low price. Many foundries are prevented from installing new equipment owing to the condition of trade; that there has been an improvement recently is undoubtedly true, and when there is a little more confidence in the improvement being maintained many of the smaller foundries will have to install new handling plant as well as melting and moulding equipment and, if the operating costs are favourable, electricity will be preferred to compressed air or hydraulic power.

With regard to metal melting, very many small iron and brass foundries could adopt the electric furnace with advantage. The coke furnace for non-ferrous metal melting is objectionable in many ways, and although the cupola is the cheapest device for the production of molten iron under normal market conditions for pig-iron, coke, and clean cast scrap iron, there are certainly circumstances in which the expense of melting is not the main factor. Under the special conditions that make the electric furnace advantageous, this type of furnace need not displace the cupola, but can be used in conjunction with it. The ability of the electric furnace, and not of the cupola, to refine and to superheat iron, and the possibility of producing cast-iron from cheap grades of ferrous scrap, have brought the electric furnace into prominence; with it a superior iron, having about twice the strength of ordinary cupola iron, can be made. Transverse strengths of 5,000 to 6,000 pounds on standard bars of "synthetic" grey iron have been repeatedly obtained, and tensile strengths above 40,000 pounds per square inch are common. One of the outstanding characteristics of electric-furnace grey iron is its resistance to impact. These advantages in strength and toughness are due largely to the physical structure of the iron, which is fine-grained and dense. The graphite exists in such small flakes that a piece of synthetic iron of the same graphitic carbon content as a piece of cupola iron will appear to contain less graphite. Although it looks whiter and harder than cupola iron, synthetic iron is soft and easily machined. A coarse-grained synthetic iron can be obtained only when the carbon and the silicon contents are exceptionally high. Ordinary synthetic iron is at least equivalent in strength to the so-called high-test irons and semi-steels of the cupola.

That is the case for electrically melting iron. Why this method is not more readily adopted by a considerable proportion of the three thousand or more grey-iron foundries in Great Britain is because foundrymen know all about cupola operation and its comparatively high efficiency, and, apart from the question of fuel charges, they are afraid to adopt electric melting because of the fear that the change will interfere, even temporarily, with the output of the foundry. It should be possible to get over objections of this kind, especially in the case of foundries that manufacture castings of the highest quality.

The Technical Side of "Talkies."

A Description of the "Vitaphone" installation at the Piccadilly Theatre.

By E. W. GALLEY.

QUITE a lot of ink has flowed recently in the non-technical Press on the subject of what, for want of a better name, presumably, are known as "Talking Films," a term commonly abbreviated to "Talkies."

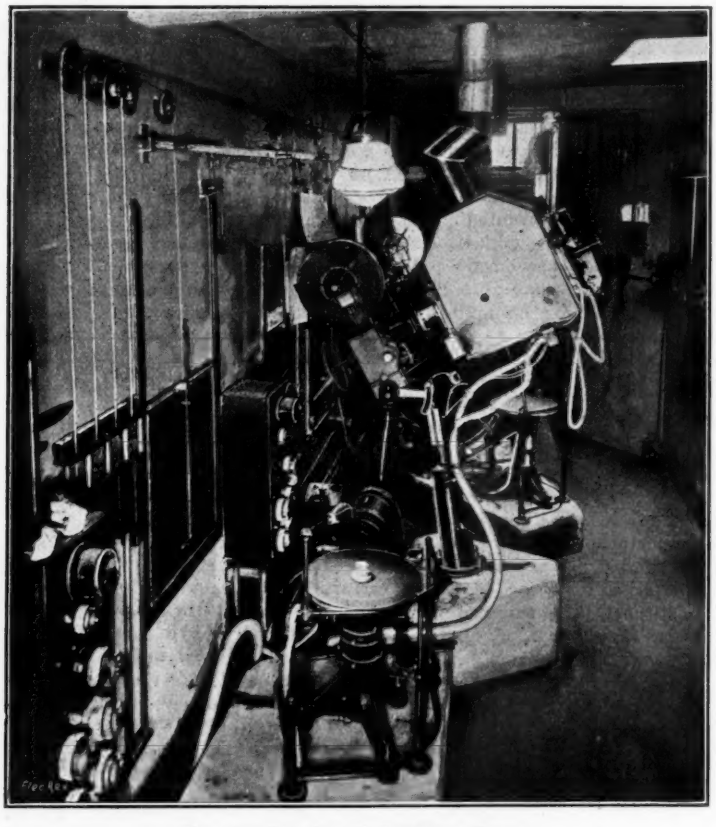


Fig. 1.—Interior of Projector Room.

Numerous kinematograph critics have had much to say about something which, if it is nothing else, is certainly a remarkable invention from the scientific point of view.

Whether "Talkies" have come to stay, or whether their reign will be brief and transient; whether they will oust the "legitimate" film and musical stage from their long-held positions in the sun of public favour, or whether they will go the way of many other loudly acclaimed innovations, I do not propose to prophesy.

Such matters do not come within the province of this article, the sole purpose of which is to afford a brief insight into the electrical aspect of the talking film, and the electrical apparatus which has brought it into being.

I was recently privileged to examine and have photographed the installation at the Piccadilly Theatre, and to the courtesy of the Western Electric Company, Ltd., of Bush House, London, Messrs. Warner Bros. Pictures, Ltd., and the proprietors of the theatre, I am indebted for allowing me facilities to obtain these notes and illustrations.

The sound projector systems of the Western Electric Company cover two distinct methods of reproduction—film reproduction and disk reproduction. In the former the sound-waves are picked up by an attachment to the film-camera, and are recorded on a specially prepared margin of the film negative. When the latter has been processed ready for reproduction, the sound track on the margin shows varying widths of light density from black to white. A special exciting lamp (not the projector lamp) is focused on to this sound track, and the light passes through a small slit in front of which the film sound track runs. The intensity of the light remains constant, but the light impression on the photo-electric cell varies according to the sound-track density. By means of the photo-electric apparatus the beam is transformed into electrical current, which is then amplified and conducted to the stage as will be later explained.

The Company's best known system of film reproduction is the "Movietone," and the best known system of disk reproduction is the "Vitaphone."

In the disk-apparatus which is installed at the Piccadilly Theatre, sounds are electrically recorded on a wax disk simultaneously with the "shooting" of the scenes. From the disk, matrices are made, and large numbers of copies are taken from each matrix in turn, just as the ordinary gramophone record is produced.

Each film has its complete sound accompaniment, consisting of one record for each reel. When a film of 1,000 or 2,000 ft. is reaching its end, a second machine (fig. 1) carrying the next reel, with its complementary sound record, is lit up. Immediately the film which is being shown and the record which is being heard are finished, a change is made on to the other machine; the change is made so quickly in shifting both the film and sound that, to the audience, the action appears to be continuous. The sound apparatus for either film or disk reproduction fits directly to the projectors already in the operating box. There is, therefore, no necessity to make any

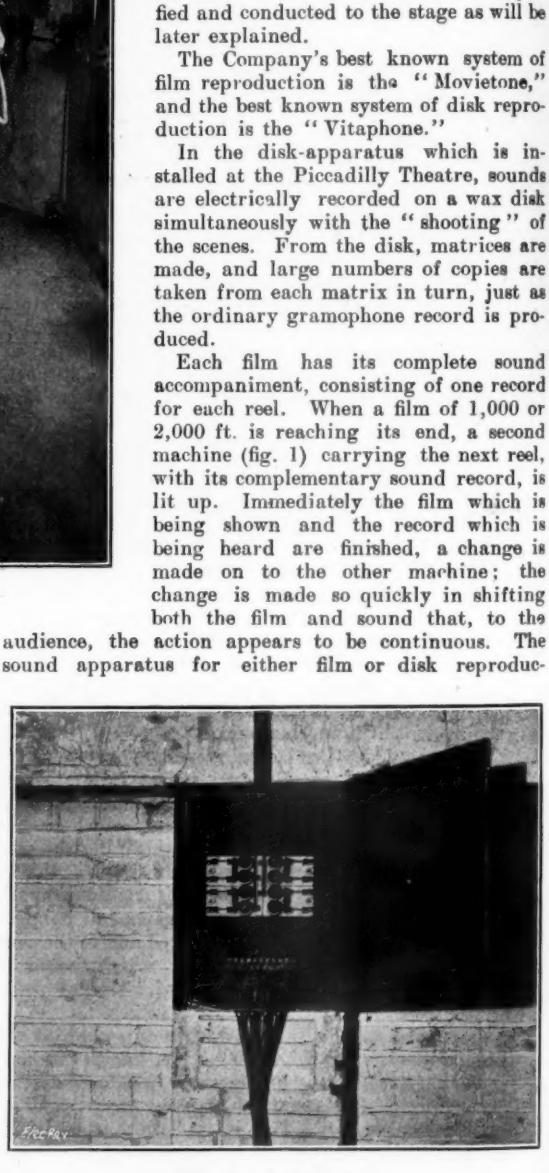


Fig. 2.—Fuseboard.

additions to the apparatus originally installed. In each set the motor which drives the turntable also drives the projector head.

Variations in line voltage up to ten per cent. are allowed for by a control box connected to both sets of apparatus, and used in conjunction with the motors. This box also maintains at the turntable a constant control of speed which does not vary more than a part of one per cent.

Two most important operations, therefore, are performed by this control box. Voltage, of course, is bound to fluctuate, no matter whence the supply is obtained, and were it not for this box the pitch would not be constant. Similarly, if the speed of the turntable were not kept invariable, perfect synchronisation would not be achieved.

A monitor horn warns the operator exactly when the sound of a disk, which is accompanying a reel, has ceased. Frequently a picture must be changed to a second machine a little before it becomes necessary to change the sound record. Hence, the operator switches on the music of the machine, which is just beginning to run, only when the monitor horn warns him of the cessation of the previous disk.

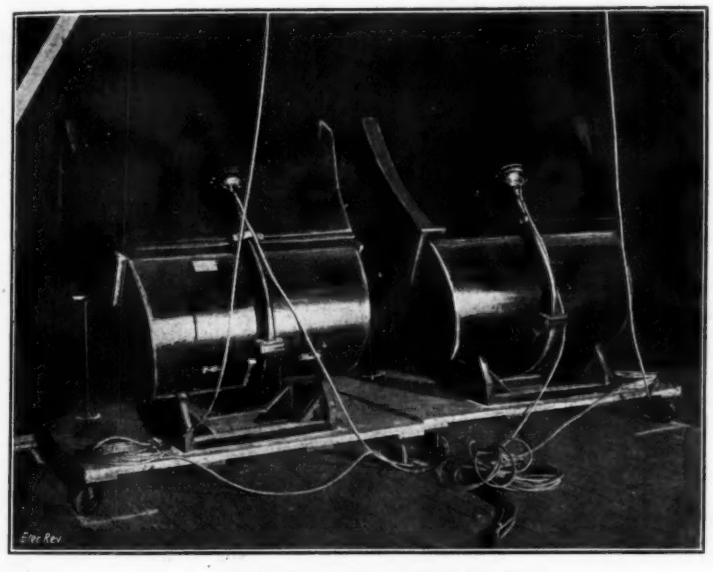


Fig. 3.—The Loud-speakers.

From the pick-up of the machine, sounds are conveyed to a main-amplifier section, which varies according to the cubic air content of the theatre in which the apparatus is installed. In other words, the section is made up of amplifiers which are exactly suited to the size and acoustic conditions of the hall, so that a huge building like Roxy's Theatre, New York, which accommodates 6,600 people and is the largest in the world, can be—and is—just comfortably filled with the right volume of sound without the slightest overloading or distortion; and the very smallest theatre is exactly suited in the same way by means of the specially-constructed amplifier section.

Having passed through this section and been correctly amplified to the volume required, the sounds are conveyed to the horns on the stage *via* a special distribution panel, which does much more than its name implies.

It is really an exceedingly ingenious selective device by means of which different types of sound are allowed to be regulated and reproduced with absolute fidelity and precision.

A purely musical accompaniment to a picture, for instance, is passed through at strength, so that the effect is exactly the same as it would be were there a full company of musicians in the orchestra-pit.

When an actor is singing or speaking with a musical accompaniment, however, the distribution panel allows his voice to pass at primary strength, whilst it subdues the accompaniment, so that the music does not tend to "drown" the performer any more than if actor and accompanist were present in the flesh.

For the unaccompanied speaking voice the panel provides special reproduction.

This distribution panel permits various types of sound to be reproduced as they should be, without calling on any particular skill of the operator, who merely makes changes with a small key according to a cue-sheet supplied with the picture.

Finally, the processes of amplification and selective distribution accomplished, sounds are conducted by v.i.r. cables, run in screwed steel conduit in the ordinary way, from the operating box to the back of the stage, where they pass through a fuse-board (fig. 2) to special 4-core, solid rubber-sheathed, flexible cords made by Henley's to the specification of the Western Electric Co., Ltd.

These cables, passing across the stage, are connected to the loud-speaker horns (fig. 3), which are placed immediately back of the stage and thoroughly insulated by means of a thick sound-proof curtain which entirely surrounds them and eliminates all unwanted echoes.

The horns are so adjusted that they distribute the volume of sound equally and evenly throughout the house. Being close to the screen, they give the correct illusion, such as speech coming from an actor's mouth, for example.

The volume of sound is varied according to the state of the house. The audience—and particularly the clothes they wear—will absorb a certain amount of the sound, so that if the house is packed to capacity there must be a greater volume than if it is moderately full or half empty.

Naturally the operator in his box is unaware of the conditions in the house, so a monitor station is situated in the auditorium. According to the advice he receives from this station, the operator changes the volume of sound to satisfy obtaining conditions.

Here, then, is a brief description of the talking film and its mode of operation. As every installation is made only under the supervision of the Western Electric Co.'s engineers, the installations in all houses are primarily the same.

Those who have read about the apparatus in the lay Press may have been impressed with the cost of an installation. It is only fair to the manufacturers, however, to point out that all materials used must be of the best—and nothing but the best.

The local contractor who carries out the installation must submit for approval to the Western Electric Co. all wire, conduit, boxes, &c., and only the best "get past."

In the case of the Piccadilly Theatre, the contractors were the Berkeley Electrical Engineering Co., Ltd., and all cables used for the "Vitaphone" apparatus and the various lighting and power circuits in the theatre were of Henley's manufacture.

The 4-core flexible cord previously mentioned was prepared by Henley's with a special colour scheme for the cores, because every Western Electric installation has a standard wiring circuit, so that a Western Electric service man can find out at once, and exactly, the location and destination of the various wires.

Several other systems of talking kinematograph films are available besides those mentioned above, and two British companies at least have been demonstrating their equipment in London theatres for some time with a considerable measure of satisfaction.

Apprenticeship in the Electrical Industry.

The Association of Supervising Electrical Engineers' Suggested Scheme.*

(COMMUNICATED)

IN the days long past apprenticeship was a really personal matter between master and apprentice. Stage by stage that personal type of servitude has given place to schemes wherein the limited company now enters into a more or less loose agreement with a boy to give him facilities for acquiring some knowledge of a certain craft. This change has been the natural outcome of the Industrial Revolution, and although some may be inclined to regret the passing of the ancient *régime*, it is significant that apprenticeship in its modern form is now engaging the attention of practically every responsible engineering organisation, not only in this country, but also in all the industrial centres of the world.

So far from apprenticeship being dead, the Ministry of Labour Inquiry into Apprenticeship and Training, 1925-26, summarised the situation as follows:

"The results of the inquiry serve to emphasise that apprenticeship is still of supreme importance in the modern industrial system, and that it is still the recognised and by far the most systematic method of entry into the ranks of skilled men in the most important industries of the country. Those who desire its retention and development must be regarded therefore as being moved not by a mere affectation for an archaic institution, but by a proper appreciation of its place among modern methods of industrial training."

A somewhat startling development in the field of apprentice training has come from the Association of Supervising Electrical Engineers—a suggested scheme of apprenticeship for the electrical industry. The following quotation from the opening paragraph contains the fundamental idea of the scheme:

"The Scheme is to apply to the electrical industry as such and not to individual employers, and the indentures will be between a Central Apprenticeship Board and the parent or guardian."

Now this is indeed a new doctrine of apprenticeship. It is not enough that we have lost the personal relation between master and apprentice: we are now invited to substitute for the present *régime* a system of apprenticeship to a Central Board so heterogeneous and impersonal as to closely resemble a New Year's Honours List.

An apprenticeship scheme for the whole electrical industry is, in our opinion, a highly commendable ideal, and if we remember rightly such a scheme was mooted, and its possibilities were fully explored by a committee of the B.E.A.M.A. under the chairmanship of Mr. A. P. M. Fleming, just after the war. But we can see no possible advantage in transferring the responsibility for training apprentices from the employers to a board, such as is suggested in the A.S.E.E. scheme. Rather do we foresee many dangers and difficulties resulting from the clashing of interests on a board of this character.

While we know of no similar scheme operating in this country, the "Joint Apprenticeship Committee" system in vogue in the building industry in the United States affords a close parallel. There the system has come into operation largely owing to the unwillingness of individual employers to take apprentices, on the plea that the seasonal character of the work makes continuous employment, and therefore training, impossible.

A paragraph from a recent issue of the *Ministry of Labour Gazette* throws some light on the working of such apprenticeship committees in America. It also shows some of the tendencies resulting from a failure on the part of the employers to realise the importance of apprentice training:—

"The committees are established for separate crafts and are composed of representatives of employers and of journeymen, and, in some cases, of the city school boards. The close association of the local vocational education authority with the joint committee is found to result in more vitality, better organisation and a more definite adjustment to the needs of the industry. Apprentices are under agreement with the committee to serve their full time and to abide by the rules of the committee, which on its side undertakes to see that the boy has continuous employment and proper facilities for training during his apprenticeship. Where joint committees do not operate, the union may serve the same purpose, the apprentice, being in effect, indentured to the local union and governed by the terms of the working agreement between the union and the employers, with the union acting as placement agent to keep the boy employed."

Another point in the A.S.E.E. scheme which seems to be open to serious criticism is the distribution of the apprentices' time in the various works and offices. The first paragraph of the scheme states that the intention is to "provide a steady supply of skilled men." It appears a little ambitious, therefore, to suggest that the training of all the *skilled men* in the electrical industry should include *three months in the drawing office*. Surely, too, it is a little difficult to conceive of all the skilled men in the industry spending nine months on the commercial and estimating side of the business. Today it is difficult to find facilities for such training for the comparatively few university men who enter the profession. To provide it for every craftsman would be utterly impossible, even if it were not unnecessary.

The limitation of numbers of apprentices by reference to a percentage of the *number of male employés* rather than to a percentage of *skilled men employed* is unusual. Whether such artificial limitations are advisable is open to question, but in any case the percentage appears to be liberal—it would permit a factory employing 1,000 adults to train 200 apprentices.

Concerning most of the remaining features of the A.S.E.E. scheme, little comment is necessary, since they are common to all well-organised schemes formulated by engineering companies for the training of their apprentices. The section defining the provision for educational facilities appears formidable when set out in black and white, but these do not differ appreciably from those offered to H.M. Dockyard and Air Force apprentices, and by many electrical engineering companies.

While we are cordially in agreement with the promoters of this scheme concerning the importance and urgency of the apprenticeship question, we cannot find in this scheme a satisfactory or permanent solution of the problem. The A.S.E.E. has tackled this job because it claims that it is in close touch with the necessities of the case on the labour side, and its members have realised that the feed into the industry is so unsatisfactory as to cause anxiety about the supply of men suitable for responsible positions ten or fifteen years hence. But the A.S.E.E. can do very little to carry out the scheme: the details would have to be settled, and the financial responsibility borne, by the larger bodies, and we have grave doubts whether these larger bodies can be persuaded to support an apprenticeship policy of so unorthodox a character.

* See also ELEC. REV., Oct. 19th, 1928, pp. 635 and 638.

The Radiological Exhibition.

Whilst the author, who visited the show on our behalf, found nothing of a revolutionary nature on view, the display provided evidence of a definite tendency towards improving the engineering design of the apparatus, particularly the high-voltage generating equipment.

By E. H. W. BANNER, M.Sc., A.M.I.E.E., A.Inst.P.

THE British Institute of Radiology incorporated with the Röntgen Society opened its 1928-29 session with a special meeting in London (November 14th to 17th), the proceedings at which were not open to the general public, although individuals specially interested in radiological work were invited to attend.

In addition to the presidential address by Dr. G. W. C. Kaye, O.B.E., M.A., D.Sc., and the papers submitted, an exhibition of modern X-ray apparatus and allied equipment was arranged (Nov. 15th and 16th), at which the majority of the British manufacturers of electro-medical apparatus, as well as a few Continental and American firms, displayed their standard lines of equipment, whilst some other firms exhibited apparatus which, although not primarily of an engineering nature, forms part of the equipment necessary for the practice of radiography.

X-rays were discovered about 30 years ago, and the progress made since then has been very great. Typical radiograms of bony structures have not shown such an improvement in detail in the last 10 years as have those of tissues, but there has nevertheless been a marked improvement of the apparatus that produces the radiograms, which is mainly evidenced by the use of larger current through the X-ray tube and very much shorter exposures. During the early part of the 1914-18 European war exposures of three minutes were quite common, whilst now the average exposure is a fraction of a second, which has been made possible by progress in tube construction, notably by the "hot-cathode," or thermionic, type, and by improved engineering means of producing the larger current required. Induction coils gave very good service for relatively small current, but for a number of years the transformer has been supreme.

Whilst induction coils were used, designs in general followed more on the lines of model makers, but the advent of the transformer fed from a.c. mains at once commenced a radical alteration in design; this progress appears to be slow in the case of some exhibits, but is less marked now than at the exhibition held last year. Other apparatus is obviously on sound engineering lines right from the commencement, and this is likely still further to increase due to two causes: first, a B.E.S.A. specification (B.S.S. 326/1928) on the performance of transformers for X-ray work has been issued and should do much to help the design of apparatus along engineering lines; secondly, as the result of the increased size of power units, it is obvious that, while a small plant may be run without disaster for a long time, a larger plant with supply mains to back it up needs much more care in installation, not the least reason being the increased danger to both patient and operator. In this respect progress may be summed up briefly as follows:—

Pre-war and early war-period: small induction coils with long exposures, the whole of the apparatus being small and near the patient.

Immediate post-war period: larger induction coils, some transformers on a.c. mains, good mechanical rectifiers, but all the e.h.p. gear still used near the patient.

Present tendency: the apparatus is now being divided sharply into two groups, the e.h.p. generating plant being located in what is, in effect, a sub-station, and only the X-ray tube being employed near the patient.

Future tendency: recent improvement of tubes and means of generating the required high voltage enables the tube to be removed to a distance from the patient. The probable design of the future is even now in operation at the Brompton Hospital, London, an installation carried out by X-Rays, Ltd.

The definite advantages of "tele-radiography," as such relatively long-distance radiography may be termed, are:—(1) Safety: the patient is in no danger of contact with e.h.p. conductors, and with modern high-powered apparatus this risk is far more likely to have fatal results than was the case with the old induction-coil outfit. (2) Increased definition in the radiograph: it is easy to see by pure geometrical optics that the minimum distortion of the image of a body is obtained when the source of X-rays is at an infinite distance from the subject. The old way of using working distances of the order of 30 or 40 inches was necessary on account of the small power available, the time of exposure even then being unduly long, but now apparatus will produce excellent photographic definition with a tube-film distance of 6 ft. In the case of plant intended for use actually in the X-ray room, there is more tendency this year to adopt engineering principles by using earthed iron cases and screens instead of wood. Whilst admitting that the user generally wants a show piece of apparatus, it is still possible to have an engineering job contained in a polished-wood case, and this is now done by most of the firms exhibiting.

For measuring the peak voltage, which is the factor that determines the penetration of the resulting X-rays, the sphere gap is used to a large extent, but the primitive point-point and the point-plate gaps are still fitted to some apparatus; their only advantage is that the longer spark which results is easier to measure. It is usual to install a small voltmeter on the control panel, connected to the primary winding of the main transformer in most cases, but calibrated in peak kilovolts. Other instruments used are in increasing number of British manufacture, which is a satisfactory feature, considering that for a long time Continental instruments were in almost universal use.

The X-ray tube requires a source of direct current at a pressure of the order of from 100 to 200 kV peak; whilst transformer manufacturers experience no difficulty in producing transformers for such voltage, the rectifier presents special problems. Two types of rectifier are now in common use: the thermionic (or hot-cathode) and the mechanical; whilst the latter has been used in various forms from the early induction-coil days, the former is of recent origin, and, although it was predicted a few years ago that it would soon become universal, it has not become so yet. Most exhibits included a valve rectifier plant as the latest design, but nearly all makers stated that they also made mechanical rectifiers as well. One American firm uses the mechanical rectifier exclusively.

The usual X-ray installation requires single-phase current for its operation, and when thermionic rectifiers are installed sometimes one and sometimes four valves are used. When one valve is used, one half of the a.c. wave is suppressed, whilst four valves give full-wave rectification. A mechanical rectifier may be arranged to utilise the tops, or peaks, of the voltage

caves, but in practice this is not found to be truly the case, partly owing to the sparking which takes place at the rectifier contacts when they are opening. Four-valve sets use the well-known bridge arrangement, by which two valves conduct at any instant, whilst the other two withstand the reverse voltage. As a constant high voltage is desirable for useful X-ray operation, condensers are added in some plant to maintain the voltage at the zero points of the transformer voltage wave; another method is to utilise a three-phase transformer fed from three-phase mains, which entails using six rectifiers, and a number of exhibitors now employ this arrangement; there is a theoretical voltage variation of ± 7 per cent. from the mean, so that even without smoothing condensers the voltage is much more nearly constant, and to the supply engineer there is the important advantage that the demand is a balanced load, instead of the very unbalanced load taken by a large single-phase unit. The two methods of using six rectifiers on three-pnase plant are shown in fig. 1 (*a* and *b*); the usual arrangement seems to be that shown in (*a*).

Regarding the operation of thermionic rectifiers, it is interesting to note that, although some hundreds

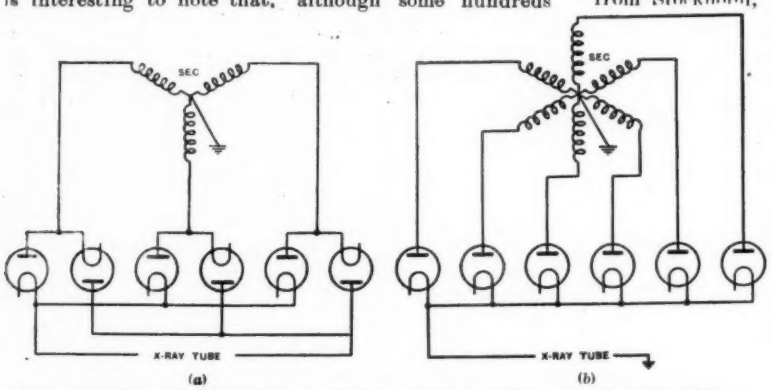


Fig. 1.—Alternative Methods of using a 3-phase Transformer and Six Rectifiers.

have been installed by the various firms over a period of some years, few failures have been recorded. The actual filament life of a rectifier is designed to be about 1,000 burning hours. As Mr. W. E. Schall, B.Sc., F.Inst.P., expressed it in his paper on "Some Engineering Lessons from Stockholm," about 7 million exposures of the average duration would be equivalent to that period, but that is not quite the case. Failures of filaments usually occur on switching-on, and it is easy to see why that is so: the ratio of hot to cold resistance of tungsten is high, and on switching-on a cold filament the initial rush of current is many times more than the operating current, so that switching-on is objectionable, although the fact that few failures occur shows that the case is not as bad in practice as would be expected from these considerations alone. In spite of this, however, their correct operation is advisable, and constant voltage tends to increase their life to about four times that obtained when running at constant current; the former case is obtained by using a good filament voltmeter, and the latter by the use of an ammeter. The use of a filament voltmeter is noticeably on the increase.

The advent of the Coolidge X-ray tube some years ago marked a definite advance in X-ray generation, and now two other types of thermionic, or hot-cathode, X-ray tubes are available; the Philips "Metalix" has been in use also for some years, and has the great advantage of embodying its own X-ray protective arrangements. The newer tube is the Muller, and it shares with the "Metalix" the property of being helium-filled at a very low pressure, instead of containing residual air at a low pressure.

The Coolidge tube has what is called a point focus, although obviously greater than a physical point, whilst the "Metalix" embodies a line focus. The inclination of the target (or antikathode) to the filament (or kathode) is 19 degrees, so that the effective rays emerge from what is in effect a point source, optically, although from thermal considerations a much larger area is available to receive bombardment from the filament.

Because of its self-protective features, the "Metalix" tube is now used very largely in modern apparatus, and in general the design of equipment for use with this tube would not suit a Coolidge tube owing to the greater space necessary and the provision of a lead-lined box, which is quite a large and heavy item. "Metalix" tubes of various ratings are available, whilst Coolidge tubes are made for voltages up to 250 kV peak. Generally speaking, the production of large X-rays tubes lags behind the provision of the electrical plant for supplying the necessary current and voltage, although progress is by no means stationary; tubes are available for pressures up to 250 kV peak, or more

The Meetings.

The papers read and discussed at the meetings* were mainly of medical interest. In one by Mr. W. E. Schall, B.Sc., entitled "Some Engineering Lessons from Stockholm," he considered the most important point about the Stockholm Exhibition† was the development of large-current thermionic X-ray tubes and rectifying valves. He amplified the advantage of using greater tube-film distances from both optical and safety considerations, and referred to progress abroad in the sizes of units in which even single-valve sets are made up to 25 kVA. He then detailed at some length the production of a nearly constant voltage from a three-phase transformer and six rectifiers, such as is indicated in the circuits of fig. 1.

In connection with the use of high-powered units, he forecast the development of X-ray rooms so arranged that the whole of the X-ray generating plant, including the tube itself, is outside the room. Such plants are even now in operation. He showed slides of a suggested room, in which tubes were placed (*a*) above the ceiling, (*b*) behind a wall, and (*c*) under the floor, to deal with any type of case.

In the discussion which followed, several speakers favoured the six-valve plant and "tele-radiography," as Mr. Schall terms the six-foot tube-film distance of working.

N.P.L. Visit.

On November 17th a visit to the National Physical Laboratory was arranged, where many items of interest to radiologists were demonstrated, the most notable being the following: The million-volt plant in the new high-voltage building was shown flashing over a string of insulators of the type now being used in the 132-kV grid system of the country. The 200-kV cathode ray tube presented to the Laboratory by Dr. Coolidge was in operation, and various substances were shown to fluoresce under the rays. The tube was excited from a large induction coil without rectifiers. The kathode rays emerge from a thin metal window in the base of the tube. A 100-kV constant-potential generator employing valve rectification and smoothing condensers supplied a steady current, the pressure of which may be kept remarkably constant. A simple form of oscillograph showed the wave-form.

Other demonstrations concerned the measurement of the protective values of lead-rubber, lead-glass, &c., spectrum analysis and its industrial applications; radium testing; a high-frequency furnace; measurement of X-ray intensity; examination of radium needles, and fluorescence under ultra-violet light.

(To be concluded.)

* ELEC. REV., Nov. 23rd, 1928, p. 809.
† ELEC. REV., Aug. 24th, 1928.

Radio Battery Eliminators.

The use of wireless telephone broadcast receiving sets energised from the domestic electricity mains, without suitable precautions, involves grave risks.

By R. H. RAWLL, A.M.I.E.E., A.M.I.Mech.E.

SINCE my article in the early part of this year in the ELECTRICAL REVIEW,* calling attention to the dangers unwittingly run by many people who use battery eliminators, and the correspondence that followed in your columns, which proved that my fears were by no means unfounded, the position, in my opinion, as an engineer in the electricity supply industry, has become infinitely worse.

With the advent of power valves requiring relatively high plate voltages and the mass production of anode battery eliminators, the latter have become popular and are in great demand. People realise that once the first cost of these apparatus has been covered, since the current taken from the mains is negligible, they have an immense advantage, compared with the dry h.t. battery, which periodically has to be replaced, and the h.t. accumulator, which takes up a large amount of space, and has also to be recharged at intervals.

Recently, in connection with the necessary inspection of consumers' installations preparatory to changing-over several sections of a d.c. system to a.c. supply, I have come across an appalling state of affairs as regards radio sets connected to the supply mains. One or two examples will suffice to illustrate what I mean. In one house a bare lead-in wire passed through the kitchen to the receiving set worked off the supply mains in the living room. The lead-in tube was situated over the sink, about 6 ft. from the tiled floor. On connecting a test-lamp between this wire and the cold-water tap over the sink, the full supply voltage was found to be present. When it is realised that the lady of the house, washing-up at the sink after meals, replaced metal saucepans, &c., on a shelf within 6 in. of this live wire, it requires little imagination to visualise what the consequences would have been had contact taken place. This had been going on for months, and the users were in perfect ignorance of the risks that they were running! In another case, a consumer had extension leads, composed of bell-wire, running all round the house, under carpets, &c., to the various rooms where the loud-speaker could be fixed. These wires were found to be in direct metallic contact with the supply mains, no output transformer being provided on the loud-speaker terminals of the receiving set; and in the kitchen, over a tiled floor, attached to this bell-wire was a pair of head-'phones for the use of the servant. One wonders what would have happened to the wearer of them had the head-band become alive through the insulation breaking down. In this case also the people were quite surprised when the danger they were running was pointed out to them.

And now the latest dangers are the sets which are appearing on the market in large numbers, which, in order to avoid unwanted capacity effects, have a metal panel or case which is connected to the earth terminal of the set and one terminal, usually the negative, of the filament battery. While working off batteries, of course, everything is quite in order, but if an eliminator is employed, the earth terminal of the set will then be insulated from the water pipe, or other earth connection, by the condenser incorporated in the eliminator for this purpose. This means that the metal panel or case is then in direct metallic contact with the supply mains, and if the supply is taken from the negative outer of a 3-wire system, it may be at the full supply pressure to earth. The serious part about this is that such receiving sets are usually installed in living rooms with wood floors covered with carpets and, although live metal is present, everything is thought to be in order because no shock has been experienced. This may go on for months, and then one day somebody will place one hand on the earth wire, or other earth connection, while touching the panel or case, with perhaps fatal consequences.

Although the majority of a.c. eliminators include a transformer in their construction, which automatically isolates the supply mains from the receiving set, there are to-day types of them on the market which do not incorporate a transformer. Thus there is equal danger with a.c. and d.c. as regards eliminators.

The I.E.E. has very wisely issued a set of regulations applying to radio apparatus connected to supply mains, but the trouble is that the public knows nothing of them. Also, since most reputable makers of eliminators usually state in their advertising matter that their products "comply with I.E.E. regulations," they mislead the purchaser, because he naturally thinks that he is quite safe in buying them, whilst, of course, the truth of the matter is that it is a thousand to one that his own receiving set, which is the most dangerous part of the whole outfit, does not comply with these regulations.

I have taken up this matter with the B.B.C., suggesting that it should issue an authoritative warning as to the precautions necessary when working radio sets from supply mains. The Corporation is, however, of the opinion that to do so would be a retrograde step, in that good reception depends on plenty of anode current being available for the power stages of receiving sets, and that any such broadcast warning would possibly dissuade many people from employing eliminators for this purpose. It thinks also that the better plan is for wireless retailers and dealers to instruct the public in the alterations necessary to sets in order to make them comply with the I.E.E. regulations. But a little thought will easily show that if a man goes into a shop to purchase a d.c. eliminator for, say, £1 10s., and he is informed that it will be necessary for him, in addition, to insulate all his terminals, fix a condenser in the aerial circuit, and a double-wound transformer between the output terminals of his set and the loud-speaker, at a further cost of, say, £1 15s., it is quite likely that he will give up the idea of purchasing the eliminator. Human nature being what it is, what dealer or retailer is going to risk losing the sale of an eliminator by pointing out these precautionary requirements?

I am coming more and more to the conclusion that serious accidents will sooner or later inevitably take place unless some authoritative warning to the public is very shortly issued as to the precautions necessary when working broadcast receiving sets from public supply mains, and it would be interesting to hear from any of your readers if I am alone in that respect.

* "Wireless and the Supply Engineer," by R. H. Rawll, ELEC. REV., March 30th, 1928, p. 545.

Modern Lighting Design.

Some examples of the Fittings described by Mr. H. T. Young at the recent E.D.A. Conference.

In our last issue we published a report of the proceedings at the second conference of the session of the Electrical Development Association, when Mr. H. T. Young, of Messrs. Troughton & Young, described

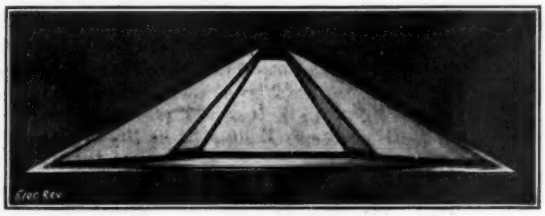


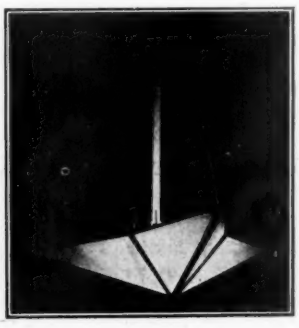
Fig. 1.—Wall Fitting.

and illustrated a new system of indoor and outdoor lighting. The accompanying illustrations show some of the fittings which have been developed. Many of the designs represent so drastic a departure from the usual type of lighting fittings, that it is perhaps not advisable to let first impressions count, but to allow time for recovery from the "shock." It is beyond doubt that generally full advantage is not taken of the unique opportunities offered by electric lighting for artistic expression, and for that reason alone the new fittings are particularly welcome. Fig. 7 is a view in the showroom referred to by Mr. Young in his paper, showing many of the fittings, and the remaining illustrations give to larger scales the fittings separately. Figs. 1 and 5 are wall fittings, and figs. 2, 3, 4 and 6 are ceiling fittings.

Some of the effects obtained from the fittings are very pleasing indeed, particularly so where the design of the apparatus is such as to have the correct influence on the structure, architecture, and decoration of the surroundings. The apparent "cubist" expression in a number of the examples should make an appeal to the "intellectuals," while the obvious simplicity of some of the designs should satisfy the "commoners." The special glass used for the system can be cut, bent, moulded, etched, sand-blasted and coloured, and because of the ease of manipulation the fittings are claimed to be inexpensive.

It is interesting to note that good business has resulted from the development of the fittings: but it is apparently not an easy task, because the standard of design must be kept up to the highest pitch. It is essential to steer clear of the vulgar and strive for refinement, and that demands the services of highly trained and artistic designers.

It is advisable to point out that no description can adequately convey a just conception of the system—it must be seen and the effects must be studied closely. So far the scheme has only been followed by a few people in this country, and Messrs. Troughton & Young are to be congratulated on the courage and confidence they have shown in developing fully a movement representing such a drastic change.



Figs. 2, 3 and 4.—Ceiling Fittings.

Fig. 5.—Wall Fitting.

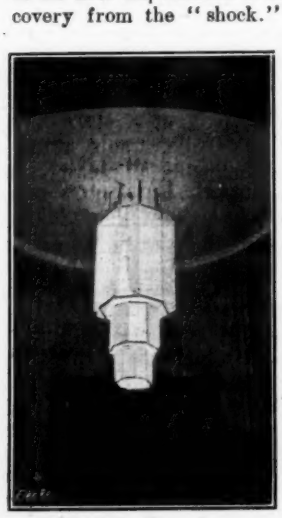


Fig. 6.—Hall Ceiling Fitting.

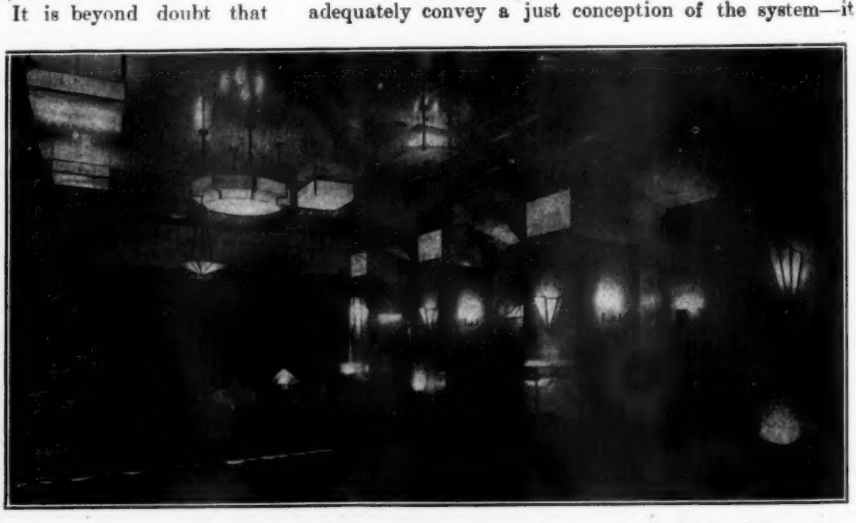


Fig. 7.—Part of Messrs. Troughton & Young's Showroom.

Domestic Electrical Apparatus.

The author urges the necessity for keeping records of the maintenance costs of electricity consuming devices on hire and hire-purchase schemes.

By INTERESTED.

DURING recent years the casual observer interested in central station work could not help noticing the continually increasing business secured by electricity supply authorities by reason of facilities offered for the hire or hire-purchase of wiring for installations within the home. Surely this step is a forward one; it has certainly been the means of affording the benefits of electricity supply for domestic purposes to many thousands of consumers, who otherwise would not have secured those privileges already in possession of the more fortunate members of the public.

Perhaps it may be surprising to some folk who are in possession of a fair supply of this world's goods, to find there is such an enormous number of others less fortunate than themselves who, for multifarious reasons, are not in a financial position sufficiently affluent to enable them to pay away money for wiring their homes so as to make use of electricity, or even to purchase certain desired domestic electricity-consuming devices.

Each house wired and consuming current for whatever purpose under hire or hire-purchase terms is an addition to that ever-widening field for the salesman to cover for the disposal of his goods, and as such it should receive from him every encouragement. The larger the number of consumers, the greater the volume of business there is awaiting the energetic canvasser and salesman. Where the supply authority offers hire terms for commodities, the salesman must of necessity deal with that authority. Many supply undertakings which hire or sell goods to customers keep a very careful check upon the useful life and repairs and maintenance of such goods, and are guided in the selection and purchase thereof by the figures appearing on their records for upkeep. It is, therefore, of the utmost importance that the salesman should put forward every endeavour to show that the particular goods with which he deals are efficient, and that replacements of heating elements are reduced to a minimum. In order to secure this it is necessary not only for him to make continuous reports to his superiors concerning repairs and maintenance of their manufactures, but to keep constantly in touch with the purchasers and conscientiously inquire into the question of upkeep upon every available opportunity. The responsible engineer at the generating station in charge of the consumers' department should welcome such

HIRE A/c.

Supplied by ..... *Date* ..... *Depreciation* ..... %

Reference Nos. : ..... *Cost Stores* .....

Sold or Transferred ..... *Value £* ..... *Wages* .....

Issues		Returned	Repairs & Maintenance					Revenue Received from Hire				Stock Value				Notes
Date	Address	Date	Date	Particulars	£	s.	d.	Quarter ending	£	s.	d.	Year ending	£	s.	d.	

Fig. 1.

INSTALLATION WIRING.

Address	Name	Hire, Hire-Purchase or Purchase	Contract No

Particulars of Installation	Price to Contractor £	s.	d.	Price to Consumer £	s.	d.	Terms

Contractor	Date of Order	Tested and Connected

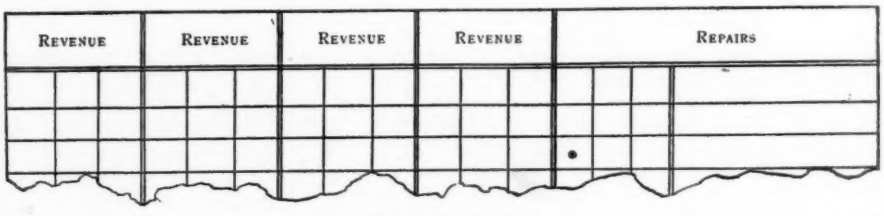
Remarks

Card issued	No. of points	Special Contractor (if any)

Fig. 2.

inquiries and afford every possible assistance in providing the desired information, all of which is ultimately to the benefit of the consumer by reason of the constant care and attention given to that question of temporary failure of apparatus.

In these modern times business competition is keen, and in this particular section of goods the salesman who keeps himself constantly in touch with both the consumer and his own works, through the supply undertaking, is the one able to secure repeat orders. In order to show to what extent records for repairs are being observed, I submit two cards, figs. 1, 2 and 3, dealing with this matter, which are in use by a certain supply works in London. These are self-explanatory, but notice will be taken of the "Repairs" column in each case.



Back of card shown in fig. 2.

Fig. 3.

Entries are made thereon from the weekly time sheets or reports, and periodically a summary is prepared showing the cost per quarter for upkeep. The information on these reports is divided into makes and sizes, so that true comparison may be seen, and an idea obtained as to whether it is preferable to pay a higher first cost and perhaps ensure a low repair bill, or a lower first charge and a higher sum for repairs, or whether the cheaper or dearer article is the better all-round business proposition.

The upkeep or maintenance figure considerably affects the manufacturer, and experience proves that it is not always the best policy to order new supplies from the lowest quotations received. A fault in any domestic apparatus annoys the consumer, whilst frequent failure destroys his confidence with the inevitable result of a lost customer, both to the manufacturer and the supply company. Too much attention cannot be paid to the question of obtaining satisfied customers, and obviously it is to the mutual advantage of the maker and the supply works to provide, at a reasonable figure, apparatus needing the minimum of repair.

The old argument frequently put forward by traders that very little, if any, assistance was proffered by municipal station engineers by way of developing new markets cannot now be entertained. Times have changed, and with them go old fallacies. Municipal stations are now large purchasers of cookers, fires, irons, fans, and so on, a market for the major portion of which would certainly not have been secured without the advantageous offers of hire or hire-purchase.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

Threadless Lampholders.

We have received from St. Albans Moulding Co., Ltd., Sphere Works, St. Albans, Herts., a sample of one of their latest productions, the "K" threadless bakelite b.c. lampholder. This is constructed in two main parts, an outer casing and the plunger unit which slides within the casing. The outer portion has a suitable collar on the inside as a stop for the plunger portion, and a thick rubber ring secured externally in a groove acts as a shade carrier ring (1¼-in. opening). The inner part is equipped with cord-grip hooks. Fig. 1 shows the construction of the device. The holder is claimed to be fireproof, shockproof, and non-hygroscopic. The company has also introduced a similar batten holder which is constructed in one piece. Provision is made in this case for a shade carrier which can be rapidly and securely fixed when required.

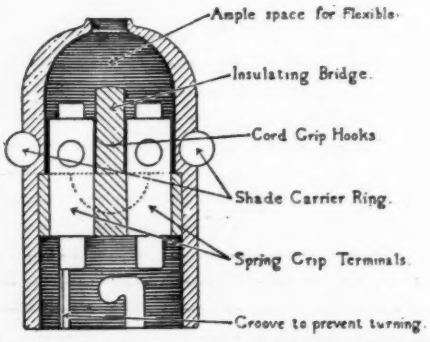


Fig. 1.—Construction of "K" Threadless Lampholder.

A Large Synchroscope and Frequency Indicator.

In a recent issue of the "Siemens Zeitschrift" some brief particulars are given of the large synchroscope lately constructed by the Siemens & Halske Co., of Berlin, for an electric power station in Germany. Such instruments are usually of a comparatively small size, and intended for close observation. In this case, however, it was desired to have an instrument that could be easily read from any part of a passage about 40 ft. in length. The instrument is about 3 ft. 3 in. in depth and 2 ft. 3 in. in width; it is suspended from the ceiling, fig. 2. In the upper part is a circular dial

Fig. 2.—Large Synchroscope and Frequency Meter.

nearly 20 in. in diameter connected up in the usual way to indicate the phase relations of the supplies which have to be kept in synchronism. Below are two frequency meters, the pointers of which, when the frequencies are correct and equal, are in a direct line. The instrument is double-sided, so that it can be read from either end of the passage.

An All-Insulated House-Service Box.

An interesting development of CLIMAX ELECTRIC CO., LTD., is the "Climax" house-service box, for the sale of which Metro-Vick Supplies, Ltd., Trafford Park, Manchester, are

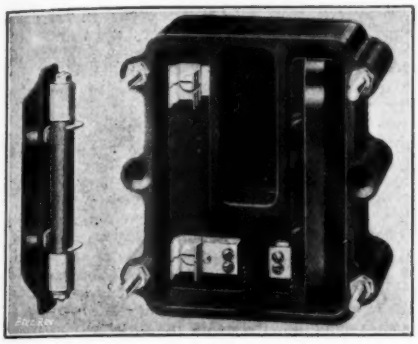


Fig. 3.—Front of Box; One Fuse Removed.

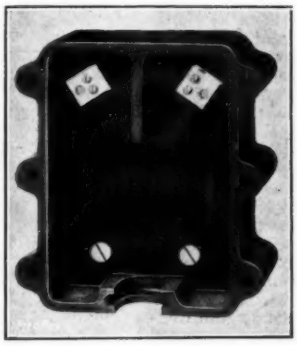


Fig. 4.—Back of Box or Sealing Chamber.

concessionaires. This very compact and neat apparatus is constructed of moulded insulating material, and is designed for a capacity of 30-60 A at 250 V. The overall dimensions are 5¼ in. long, 5¼ in. wide, and 3¼ in. deep; the weight is 4 lb. Figs. 3 and 4 show the front and back of the box, respectively, the cover in each case being removed. The back of the box embodies the sealing chamber for the supply cable, and the construction is such that the "live" terminals are at the top. The front portion is divided into three sections—two "ways" for the fuses and a central section for the entry of the installation leads. Bridge-type fuseholders, also of insulating material, are employed, and these accommodate by a simple slip-in method "Climax" cartridge fuses. These, it is claimed, will definitely clear a "dead short" at double the rated voltage. The fuse can be re-wired on site.

An Electric Warming Pan.

The COOPER-STEWART ENGINEERING CO., LTD., Stewart House, 136-7, Long Acre, W.C.2, has recently introduced a new electric warming pan or foot warmer, fig. 5. It is made of brass, nickel plated and highly polished, and is 9¼ in. in

Fig. 5.—Foot Warmer or Warming Pan.

diameter. It is claimed that connection to the mains for about ten minutes is sufficient to provide for several hours' heat radiation. The consumption is 400 W.

Legal.

British Thomson-Houston Co., Ltd., v. Antrobus.

MR. JUSTICE MAUGHAM, in the Chancery Division, on November 20th, gave judgment for the British Thomson-Houston Co., Ltd., in an action against Antrobus.

Mr. TREVOR WATSON, for the company, asked for judgment in default of defence. He said the action had reference to the company's patents for electric lamps which had been held valid by the House of Lords.

His LORDSHIP granted a perpetual injunction against infringement by the defendant.

Electricity Supply by Slough Estates, Ltd.

MR. JUSTICE CLAUSON, in the Chancery Division, on November 20th, on the petition of Slough Estates, Ltd., sanctioned an alteration of the company's objects so as to enable the company to supply electricity and water to persons outside their estate.

Mr. WAITE, for the company, said that there was no opposition. The company bought the property, which was known as the Slough Estate, from the Government, and developed it by letting it to tenants, mostly big industrial concerns. On the estate were an electricity and a water plant which had a surplus, and the company wanted to use this surplus for supplying outside people.

Alleged False Trade Description.

The Times reports that at the Lambeth Police Court, on November 24th, Robert W. Coles, a traveller, of Brixton, was charged on remand with selling h.f. chokes to which the trade name "Lissen" had been wrongfully applied. Mr. H. D. ROOME, prosecuting, said that he was now in a position to prefer further charges against the defendant of obtaining money by false pretences, as he knew that the articles which he supplied were spurious. On October 5th the defendant went to the shop of a Mr. Gray, in Barking Road, and offered the chokes in question, which he described as "Lissen" chokes, at a price lower than that charged by Lissen, Ltd., and on this and a further occasion Mr. Gray purchased some. Later Mr. Gray was prosecuted and fined for selling the chokes as "Lissen" products, and the arrest of the defendant was the outcome of that case. Mr. GRAY, in evidence, said that he would not have bought the chokes if he had not believed them to be genuine, and another witness said that the articles were useless for the purpose for which they were intended. The defendant was remanded for a week, bail being allowed.

The Marconi Royalties Appeal.

IN the Chancery Division, on November 20th, Mr. Justice Tomlin was asked to fix a date for the hearing of the appeal of Marconi's Wireless Telegraph Co., Ltd., against the recent decision of the Comptroller-General of Patents. His LORDSHIP said that his list included a number of lengthy actions taking precedence of appeals which would probably occupy the remainder of the term. In the circumstances he was unable to fix a date, but if one of the prior actions was settled a further application could be made.

Thefts from Electricity Meters.

WHEN Amos Wilson (20) and James E. Ainsworth (19), two fitfiters, were charged recently at Fleetwood with breaking open electricity meters of dwelling houses and stealing money, the police said since last May collectors had found locks of electric light meters broken open in such a way that householders could not detect that they had been tampered with. The collectors on reading the meters discovered a deficiency in the money. Defendants were each fined 40s.

Reductions of Capital.

IN the Chancery Division, on November 26th, Mr. Justice Eve had before him a petition of Edison Accumulators, Ltd., for confirmation of a reduction of capital of the company from £250,000 to £27,927. Mr. BISCHOFF, for the company, said that the reduction would wipe out all the 1s. ordinary shares and reduce the £1 preference to 2s. shares. It was then proposed that the reduced 2s. shares should be consolidated into £1 shares and become a single class of ordinary shares. Some preference shares were to be forfeited. The shares held in a subsidiary company called Electric Cars, Ltd., were written down as valueless. His LORDSHIP confirmed the reduction.

Mr. Justice EVE, on the same day, confirmed the reduction of capital of the British Arc Welding Co. (Bristol Channel), Ltd., from £20,000 to £13,000. Mr. BUCKMASTER, for the company, said it was proposed to write off £4,600 from the issued capital, and at the same time reduce the unissued capital.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Electricity (Supply) Bill, 1928.

On November 21st, this Bill was read a second time. The effective clause of the Bill reads: "Section 16 of the Electricity (Supply) Act, 1919, shall have effect as if the words 'before the said 8th day of May' wherever they occur in that section were omitted." The section referred to provided that any "officer or servant" who was employed by an undertaking *before* the date mentioned was entitled to claim

compensation for loss of employment or reduction of position on account of the operation of the Act.

The Bill passed through Committee and was read a third time on November 22nd.

Overhead Lines in North Wales.

On November 22nd, Sir R. Thomas asked the Minister of Transport whether he was aware that considerable disfigurement of the natural beauties of North Wales had been caused by the erection of transmission standards for electrical power; that at least one municipality was protesting; and whether he would take action in this matter.

Colonel Ashley said that it was the case that some applications for consent to the erection of overhead lines in North Wales were now before him, to which the local authorities concerned had not given their approval. In any such case the local authorities would be given an opportunity of being heard, and his consent would not be given except after careful consideration of their representations and of all the circumstances of the particular case.

Extension of the Fulham Station.

On November 20th Mr. Saklatvala asked the Minister of Transport if he was aware that the Central Electricity Board had adopted measures to acquire compulsorily the property and works belonging to a company in Fulham, employing an average of 115 persons and having a record of steady trade for 16 years; and whether, in order to avoid creating unemployment, he would direct the Board to select another site.

Colonel Wilfrid Ashley said he was informed by the Central Electricity Board that it had taken no steps to acquire land or works at Fulham, but that at the request of the Board the Fulham Borough Council was considering the extension of its existing generating station. Should it be necessary for the Council to apply for compulsory powers for this purpose under the Electricity (Supply) Acts, it would fall to the Electricity Commissioners, before making an Order, to take into consideration all the circumstances of the case. Suitable sites for generating stations for the requirements of Greater London were extremely hard to find and almost necessarily involved the acquisition of land now used for some other purpose.

The "Beam" System.

In the House of Commons, on November 26th, Mr. W. Benn asked the Prime Minister whether the consent of the House would be sought before the Postmaster-General leased the "beam" system to the Communications Company. Mr. Baldwin replied that the system would be leased under the general powers conferred upon the Postmaster-General by the Post Office Act, 1908, and the consent of the House was not necessary. In reply to a question by Mr. Pethick-Lawrence, the Premier said that it was also unnecessary to submit the detailed agreement with the company to the House for its approval. He would consider, however, whether the agreement should be laid before the House for information.

Electricity Charges in Wandsworth.

New Tariffs Proposed by the County of London Co.

A FURTHER stage in connection with the agitation for lower charges for electricity supply in the Borough of Wandsworth falls to be recorded. It will be remembered that, as a result of the agitation, an inquiry was held in May last by the Electricity Commissioners into an application by the Wandsworth Borough Council, and a committee, acting on behalf of the consumers, for a reduction of the maximum price permitted to be charged by the County of London Electric Supply Co., Ltd. The inquiry was eventually adjourned in order to allow the company to place before the applicants certain proposals with regard to a two-part tariff which it claimed would meet the demand for lower charges.

A conference between the supply company and a deputation from the Joint Electricity Committee of the Borough Council took place at the company's offices on July 13th last, when details of the proposed two-part-tariff scheme in respect of domestic premises were submitted. These were set forth in our issue of July 20th, p. 111. The representatives of the Borough Council expressed themselves as most disappointed with the proposals put forward by the company, and strongly urged the company to make some immediate reduction in the present flat-rate prices to all classes of consumers. The next stage in the proceedings took place on November 14th last, when the company sent a long letter to the Town Clerk of the Wandsworth Borough Council, in which it was stated that the company had decided to announce forthwith two classes of two-part tariff—one for domestic consumers and one for business consumers (*i.e.*, for shops, offices, public institutions, churches, and premises used for purposes of a business nature), both schemes to come into operation from and after the December quarterly meter readings. The two-part tariff for domestic consumers remains the same as that made known in July last; the only amplification of the scheme is that household premises will be divided into twelve groups—lettered A to L—the fixed quarterly charge being 15s. for group "A" houses with a floor area of 1,200 sq. ft., and the scale increasing progressively up to £3 2s. 6d. per quarter for group "L" premises, with a floor area of from 5,001 to 5,500 sq. ft.

Accompanying the letter was a schedule giving details of two actual examples of the effect of the two-part tariff on each of the twelve classes of houses, one example being for a consumer using below average quantity, and the other for a user taking more than the average. The schedules show that under the existing charge of 6d. per unit, plus meter rents, in the case of "under average," consumers, the cost per unit works out at from 7.07d. down to 6.25d., while under the two-part tariff the cost would range from 6.38d. to 5.75d. Similarly, in the case of "over-average" consumers, they indicate that the current cost ranges from 6.8d. to 6.16d., including meter rents, under the 6d. per unit charges, and from 5.32d. to 3.72d. under the two-part tariff. In all the examples quoted the two-part tariff shows some economy to the consumer, however, not being appreciable until the amount of energy taken shows a material increase over that at present used.

Coming now to the new proposals of the company with regard to a two-part tariff for shops and business premises, the scheme provides for a fixed quarterly charge of 7s. 6d. per 100 watts, or £15 per kW per annum, of installed capacity for lighting, plus 1d. per unit for energy used for any purpose, no meter rents being chargeable. The effect of the proposals is shown in a separate schedule, the costs in all cases, even on present consumption quantities, being in favour of the user, with a further reduction in the unit cost as the quantity taken is increased.

A meeting of the Borough Council Joint Electricity Committee was held on Monday last, November 26th, to consider the company's latest proposals. While it was agreed that these were a distinct advance on those originally put forward, regret was expressed that the company had not seen its way to meet the demand for a lower price for energy supplied on the present basis. Moreover, it was felt that the position of the Committee had been handicapped by the decision of the company to announce its two-part tariffs forthwith, without giving the Joint Committee an opportunity of considering the schemes. A long discussion took place, and in the end it was decided to inform the company that the Committee was willing to accept the proposed two-part tariffs subject to emendation in the details, both as to the fixed charges and the secondary unit charge. In connection with the private-house lighting two-part tariff, it was felt that this would be of no benefit to the majority of householders in the borough, and that to encourage the use of electricity in small houses a lower minimum than 1,200 sq. ft. should be introduced, *i.e.*, one of 10s. per quarter, or £2 per year, for houses of up to 800 sq. ft. floor area. With regard to the two-part tariff for shop lighting, it was shown that, despite the company's schedule of examples, there were shops in the borough using maximum, normal, and after hour lighting that would receive no benefit under the two part tariff. There were also other points in the schemes which needed further consideration before they could be definitely approved and it was resolved to communicate the Committee's views to the County of London Co.

Reviews.

Principles and Applications of Electrochemistry. By H. Jermain Creighton. Vol. I, Principles. Second Edition, revised and enlarged. Pp. xvi+488; figs. 84. London: Chapman & Hall, Ltd., 1928. 20s. net.

As the title indicates, this volume deals with the principles of electrochemistry, and it covers in a satisfactory manner the principal methods of measuring conductivities, ionic mobilisations and electromotive forces, together with a general discussion of the electrochemistry of gases. In a preface to this revised edition, the author states that the question of an alteration of treatment throughout the book to conform to the "activity" concept has been carefully considered, but it has been thought best to postpone such a change to a future time, when further experimental data have been obtained and this and allied conceptions have been stabilised. In this second edition numerous additions have been made both to the text and references, these being necessitated by the progress of electrochemistry during the three years that have elapsed since the publication of the first edition. Among the changes introduced are new sections on the polarity of molecules, and the Coolidge cathode ray tube and new chapters have been added on the "activity" concept and on the interionic attraction theories of strong electrolytes, the latter chapter being largely devoted to the Debye and Hückel theory.

It is not necessary to detail the contents of a book so well known, but the subjects which have been most modified as the result of recent researches are the sections on: Electrical Units, Osmotic Pressure, the Moving Boundary Method for the Determination of Transference Numbers, and the Relation between Chemical and Electrical Energy.

In dealing with the polarity of molecules, Dr. Creighton formulates that when atoms combine to form a symmetrical molecule, the mean electrical centre of the positive nuclei coincides with the corresponding centre of all the electrons, and the molecule has no electrostatic moment. In unsymmetrical molecules the centres of the opposite charges do not coincide and each of these molecules may be regarded as an electric dipole, the electric moment of which is equal to the product of the distance between the two centres and the total electric charge of either sign in the molecule. Hence, when a liquid—the molecules of which are polar—is placed in an electric field, this field will tend to orient the electric dipoles in such a manner as to reduce their potential energy to a minimum.

Of the two new chapters (Chapters XIV and XV) introduced into this edition, the former dealing with the "activity" concept theories of strong electrolytes, is of importance. When the law of mass action is stated in terms of activities it becomes universally valid. The concept of activity has been widely used in recent years in the studying of strong electrolytes. Owing to the doubtful significance of the degree of dissociation as determined by the conductance method, this quantity has been almost universally replaced in the interpretation of the properties of strong electrolytes by a function called the activity-coefficient or the thermodynamic degree of dissociation, which is the ratio of the mean activity of the ions to the total molal concentration of the electrolyte. Chapter XV, on the "Interionic Attraction Theories of Strong Electrolytes," is of outstanding importance, pages 321 to 332 dealing exclusively with the development and verification of the Debye and Hückel theory of strong electrolytes, a theory which appears to approach a solution of the problem of strong electrolytes in dilute solution. While this theory cannot be regarded as complete, its scope and character indicate that a decided advance has been made in our understanding of the behaviour of dilute solutions of strong electrolytes. The above summary should serve to show the wide scope of the author's studies in modern electrochemistry. To those who are interested in the astounding progress of this branch of physical theory, the author's interpretation will be welcome. The impression left on the reader's mind after considering the contents of this book is the great progress in our knowledge of electrolytic dissociation and electrokinetic energy and phenomena in general. Within comparatively recent years the investigations into this realm of scientific research have practically eliminated the distinction between chemistry and physics and established electricity as the common foundation. The author has dealt with the subject in a complete and well-balanced manner and has set out lucidly and comprehensively the basic and fundamental principles of electrochemistry. Great care has been taken to bring the work thoroughly into line with recent theories necessitating much rearrangement of the text, and the praiseworthy efforts of the author in this direction have been attended with conspicuous success. To define, arrange and summarise so much material in so interesting and authoritative a manner is an achievement of no mean order, and this new edition will be consulted with interest by all desirous of obtaining an account of the recent advances of the theoretical aspects of electrochemistry.

Continuous Current Engineering. 3rd Edition. By ALFRED HAY, D.Sc. Pp. xiii+372; figs. 190. London: Constable and Co., Ltd. Price 14s. net.

The facts that this volume is now in its third edition, that the first one was reprinted once and the second reprinted three times should be sufficient indication of its real worth and popularity. In all probability there are very few of us without our Hay, so that the new edition, which constitutes a considerable revision of the earlier work, will be accorded a very warm reception. The present volume consists of 18 chapters, ranging in subject from fundamental electromagnetic laws to the theory of continuous current machines and the study of c.c. instruments, lamps, switches and accumulators. It is, of course, to be borne in mind that the volume is only intended to be an introductory course to the subject, so that the treatment covers a wider field than would one dealing simply with continuous current machines only. In the present volume 47 pages are devoted to electromagnetic laws, induction, hysteresis, &c., 61 pages to instruments and meters, 67 pages to the theory of c.c. machines, 17 pages to descriptions with illustrations of the mechanical parts of c.c. machines, 48 pages to induction density values, losses and tests of c.c. machines, 31 pages to batteries and boosters, 52 pages to arc and incandescent lamps, 30 pages to continuous current switches, and 18 pages to conducting and insulating materials. We need hardly say that the text is remarkably clear, and, having been brought up to date, forms once more a thoroughly useful addition to what is rapidly becoming an overflowing library. The volume is attractively produced, and is bound in a most durable form.

S. AUSTEN STIGANT.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Factory Lighting Campaign.

The Campaign progress report to November 23rd, 1928, issued by the British Electric Development Association, shows that the total number of inquiries received in reply to the Campaign propaganda is 2,240. Arrangements have been made for all the inquiries to be followed up, and the Association is daily receiving evidence of considerable business arising out of the Campaign. Sixty lecture-demonstrations have been given to industrial consumers, factory owners and works managers in all parts of the country. Further lectures have been arranged or will shortly be fixed. The total number of lecture-demonstrations given is 115. A lecture-demonstration is to be held in London on December 3rd at the Lighting Service Bureau. Invitations have been issued to the owners of factories and workshops and to shop stewards and firemen in a number of London and Greater London boroughs. Arrangements have been made for a second and concurrent lecture to be given by Mr. W. J. Jones.

Australian Duties on Radio Apparatus.

An application for increased duties upon radio apparatus imported into Australia has been under consideration by the Commonwealth Tariff Board. The existing duties are as follows: British preferential, 35 per cent. *ad valorem*; intermediate, 50 per cent.; and general, 55 per cent. While the applicants (a group of Australian manufacturers) desire that these rates shall continue to be imposed on parts, they ask that upon complete sets there shall be a specific duty per valve-holder, as follows: British preferential, 30s.; intermediate, 40s.; and general, 50s. For the applicants it was maintained that if the Australian radio industry was ruined, importers would be free to exploit the public. On the other hand the opponents said that there was evidence that the industry was prospering protected by the present rates; it was unwise to prohibit the importation of reasonably-priced quality sets.

Employment during October.

The November *Ministry of Labour Gazette* shows that total unemployment rose from 9.5 per cent. on October 24th, 1927, and 11.4 per cent. on September 24th last to 11.8 per cent. on October 22nd. During last month employment in the engineering industry was still very slack, but continued to show improvement on the whole. The number of unemployed in the industry fell by 5,209 to 91,865, and the proportion from 9.9 to 9.4 per cent. Employment in the electrical engineering industry remained fair, and the proportion of unemployed was stationary at 5.2 per cent. The same applied to the electric cable, wire and lamp manufacturing group, in which the figure remained at 5.3 per cent., the number actually unemployed being 4,610. There was a slight improvement in the electrical wiring and contracting industry, the number of unemployed falling from 1,049 to 1,034, and the proportion from 6.8 to 6.7 per cent. Those who follow the figures month by month will observe that the September percentages have been altered owing to a revision of the basic figures.

Catalogues Wanted.

Messrs. E. G. Dowse & Co. have purchased a 17-acre site at East London, South Africa, where they intend to establish a large foundry and general engineering works. Messrs. Cutbill, King & Co., Ltd., of 32, St. Mary Axe, E.C.3, who are their purchasing agents on this side, ask on their behalf for catalogues for foundry plant, machinery, equipment, &c., from manufacturers to forward to South Africa.

Swedish Activity in Russia.

In connection with the reported new concession policy in Russia, the Soviet Press reports a representative of the Allmänna Svenska Elektriska A.B. as stating that the works now being constructed at Yaroslav will be the most modern in Europe from the standpoint of equipment and production, and will be brought into operation next August or September at a cost of from 15 to 18 million roubles. The works will have an output capacity of 30,000 motors of an average of 10 kW, although machines of up to 700 kW will be made. While the building operations are in progress, the Swedish company is said to be producing between 400 and 500 motors per month at another works in Russia, where the semi-manufactures imported from Sweden are assembled, and Russian workmen are being trained for the large new works. Apprehensions are entertained concerning the supply of raw materials, particularly copper and dynamo iron. It is, however, hoped that Russia will be able to furnish the necessary raw materials until the time arrives for the company to start its own installations and thus be independent of imports from other countries.

Manufacturers and De-Rating.

In the course of his speech as president at the annual meeting of the National Union of Manufacturers, Mr. George Terrell said that the Government's de-rating scheme would be a great boon to industry in bad times like the present. It would help manufacturers to equalise their present heavy burden of taxation with the lower rates which their foreign competitors paid. On the other hand they had been threatened with a new Factories Bill which would have involved every manufacturer in great expense. The Bill had been withdrawn for the present, but was bound to be reintroduced later on. Mr. Terrell also referred to the Union's suggestions in connection with "safeguarding," most of which the Government had approved.

A Review of American Conditions.

Speaking at Manchester last week, Dr. Alberto Pirelli, president of the International Chamber of Commerce, reviewed the economic position of the United States. He said that while in the last 25 years the population had risen by 60 per cent. the industrial production had increased by 300 per cent. In the last seven years, while production had risen by a third, the number of persons employed had actually fallen by 8½ per cent. In five years the electrical power used per head of the people employed had risen from 3.25 to 4.5 h.p. Among other things, the United States, with 6 per cent. of the world's population, now had 60 per cent. of the world's telephones and telegraphs and used 35 per cent. of the electric power produced in the world.

Recent Contract.

The Harland Engineering Co., Ltd., has received an order, on behalf of the Canadian Government, for all the electric motors required to operate the sluice valves and taintor valves of the lock gates on the Welland Ship Canal, Ontario, the construction of which will rank as one of the most notable civil engineering undertakings of the day. It will open up over two thousand miles of inland waterways for navigation and will permit ocean liners to use the Great Lakes of Canada.

New Showrooms at Salford.

On November 16th Alderman G. Billington, chairman of the Salford Electricity Committee, formally opened a new electricity showroom adjoining the Town Hall. Among those

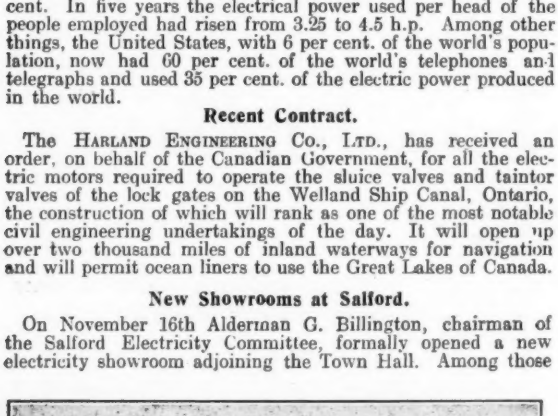


Fig. 1.—The New Salford Showrooms.

present was Dr. S. Z. de Ferranti, F.R.S., who spoke of the great future for electricity in the home. The new building is of Portland stone, with a frontage of 72 ft., and it is electrically heated throughout. The whole of the ground floor, which consists of one room with large windows, will be used for the display of lighting fittings and all types of domestic electrical appliances. In the basement there is a central open space, around the walls of which are small panel paintings depicting some of the uses of electricity, and at the sides are furnished "all-electric" rooms consisting of dining room, drawing room, kitchen, bedroom, bathroom and wash-house. In addition, there is a demonstration kitchen where lectures will be given. The scheme of decoration is one of a restful and dignified character, the ground floor walls being panelled

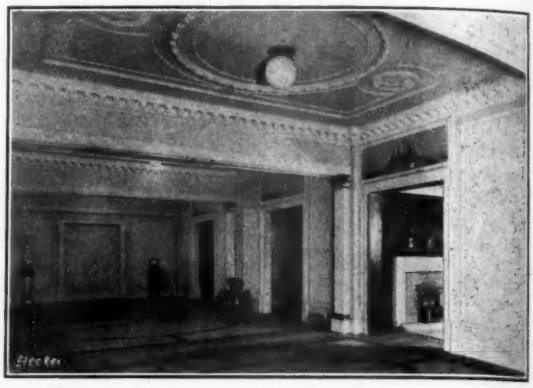


Fig. 2.—"All-electric" Rooms in the Basement.

in oak, and the specimen rooms in the basement are decorated and furnished appropriately to the uses to which they are put. The architects of the buildings were Messrs. Charles Swain and Partners, and the builders Messrs. Robert Carlyle & Co., Ltd.; Messrs. Frank Drury, Ltd., carried out the decorations and furnishings. There has been steady progress in the consumption of electricity for domestic purposes in Salford, and now that the showroom has been opened there is no doubt that this progress will be greatly accelerated through the hire, hire-purchase and sale of all kinds of domestic electrical appliances, and the low price charged for electricity. We reproduce herewith photographs of the exterior and basement of the new premises.

Calendar.

To Messrs. Crossley Bros., Ltd., belongs the distinction of providing us with the first of the 1929 calendars. This has boldly-figured monthly sheets, each of which bears a picture of one of the company's engines and other products.

The British Industries Fair.

An increase of over 300 per cent. in the number of overseas buyers who have promised to attend the next British Industries Fair was revealed last week by Mr. Douglas Hacking, M.P., Secretary to the Department of Overseas Trade, as a result of a comparison made with the replies received up to the corresponding date last year.

Book Notices.

"Electric Wiring," by W. C. Clinton and E. H. Freeman. Pp. ix+260; figs. 95. London: John Murray. Price 4s. 6d. net.

"The Home Electrician." Part 2. "Fuses and Wires." By T. M. F. Tamblyn-Watts, A.M.I.E.E. Price 9d.—The second part of this work contains data and other information likely to be useful to electric wiremen. Tables for standard wires are included.

"Economic Conditions in Bulgaria." A report by Mr. C. Bramwell, of the British Legation, Sofia (28 pp). London: H.M. Stationery Office (for the Department of Overseas Trade). Price 1s. net.

"Science Abstracts (A and B)." Vol. XXXI. Part II. London: E. & F. N. Spon, Ltd. Price 3s. each.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLVII. November, 1928. New York: The Institute. Price $1.

"Automaton, or the Future of the Mechanical Man," by H. Stafford Hatfield. Pp. 100. London: Kegan Paul, Trench, Trubner & Co., Ltd. Price 2s. 6d. net.

The Sydney Electricity Department.

The Sydney *Daily Guardian* reported recently that the Civic Commissioners were considering the creation of a new position of general business manager of the Electricity Department at a salary ranging from £1,500 to £1,800 per annum. The Commissioners had already decided to create a new position of chief accountant in the Department at a salary of £850. Our contemporary says: "The whole trouble appears to be over the fact that Commissioner Garlick wants to run the Department on different lines to Mr. Mackay."

Unemployment.

There was a decrease of 1,580 in the number of registered unemployed during the week ended November 12th. The total fell to 1,348,200, as compared with 1,349,780 on November 5th, and with 1,125,740 on November 14th, 1927.

Swedish Electrical Exports.

The exports of electric motors, generators, and other machines from Sweden during the eight months ended with August last attained a value of £1,626,445, as compared with £1,116,250 in the corresponding period of 1927. There was also a notable advance in the exports of telephone and telegraph apparatus—from £302,480 to £479,340.

A Birmingham Electrical Display.

As we reported at the time, the Birmingham Electric Supply Department exhibited at the recent Health and Hygiene Exhibition, held at Bingley Hall. The exhibition was visited by large numbers of people daily and the stand attracted considerable attention. It contained a selection of electrical

An Electrical Exhibit at Birmingham.

domestic apparatus, including cookers, water heaters, washing machines, vacuum cleaners, irons, kettles, and other labour-saving appliances. A view of the display appears herewith.

Bankruptcy Proceedings.

G. COHEN, electrical engineer, 49, Newman Street, Oxford Street, W.—The creditors in this failure met on November 16th before Mr. Walter Boyle, Senior Official Receiver, at the London Bankruptcy Court. Proofs of debt to the amount of £3,805 were called over, and a resolution was passed for Mr. S. P. Child to act as trustee and administer the estate in bankruptcy.

E. LANE, electrician, 50, Angerstein Road, North End, Portsmouth.—Receiving order made November 14th, on debtor's own petition. First meeting November 30th, at the Official Receiver's office, 87, High Street, Portsmouth. Public examination, December 3rd, at the Court House, Portsmouth.

G. A. NORMAN, electrical engineer, 11, Freeman's Yard, Barnsley.—First meeting held November 27th, at the Official Receiver's office, County Court Hall, Barnsley. Public examination, December 20th, at the County Court Hall, Barnsley.

H. SAVORY, electrical engineer, 7a, Hill Street, Shaw, Lancs.—First meeting held November 28th, at the Official Receiver's office, Byrom Street, Manchester. Public examination, December 5th, at the Court House, Oldham.

J. B. WICKSTEAD, R. J. ALLEN and L. KNIGHT (C. Cooper and Co.), plumbers, electrical engineers, &c., 26, King Street, Stretford.—Last day for proofs for dividend, December 4th. Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester.

A. L. WEEKES, electrical engineer, 13, Crescent Road, Bedford.—First and final dividend of 6s. 4d. in the £, payable at the Official Receiver's office, The Parade, Northampton.

A. C. COOPER, electrical engineer, 1a, Sherwood Street, Scarborough.—First and final dividend of 3s. 11½d. in the £, payable at the Official Receiver's office, 48, Westborough, Scarborough.

C. H. MARCHANT, electrical engineer, 9, South Street, Tarring, Worthing.—Receiving order made November 21st, on debtor's own petition.

J. S. RHODES, electrical engineer, 102, Morley Street, and 74, Horton Lane, Bradford.—Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford, released November 16th.

E. R. H. SYMONDS, electrician, 4, Nelson Road North, Great Yarmouth.—Trustee, Mr. C. B. L. Prior, Official Receiver, 9, Queen Street Chambers, Norwich, released November 14th.

F. A. WILLIAMS, electrician, 96, Churchill Road, Great Yarmouth.—Trustee, Mr. C. B. L. Prior, Official Receiver, 9, Queen Street Chambers, Norwich, released November 14th.

H. J. HODDINOTT (Hoddinott & Co.), electrical fittings supplier, 3 & 5, Cathedral Yard, Manchester.—First and final dividend of 2s. 5d. in the £, payable December 3rd, at the Official Receiver's offices, Byrom Street, Manchester.

Company Liquidations.

PORTABLE UTILITIES CO., LTD., Fisher Street, W.C.2, radio and electrical factors.—A meeting of creditors was held on November 19th, at the Cannon Street Hotel, E.C., when Mr. F. S. Salsman, Bucklersbury, E.C., the liquidator, presided. The chairman said that he had prepared an approximate statement of affairs, which disclosed liabilities of £11,500, of which £5,810 was due to the trade; the Electrical Appliance Co. was a creditor for £5,900, and there were contingent claims in respect of guarantees amounting to £1,150; royalties, &c., amounted to £555, and wages and commission £55. With regard to the Electrical Appliance Co., the actual amount which was put down to rank for dividend was £5,100. The deficiency was due to: Trading losses, £4,151; depreciation of stock, £2,950; liability under a hire-purchase guarantee, £349; bad debts, £523; and depreciation of furniture, &c., £40. The company was formed in 1912, with a nominal capital of £500, divided into 500 shares of £1 each, of which 130 shares were issued for cash. During the early stages of the company's trading it manufactured various electrical commodities, and in 1924 commenced to make and sell radio components. According to the balance sheet, in March, 1925, there was an excess of assets over liabilities of £7,463, and in the following year an excess of assets totalling £6,396. About that time l.f. transformers which the company had manufactured in large quantities returned to the company under guarantees which had been given. A considerable sum of money was lost by repairing them free of cost. By the end of September, 1927, there was an excess of assets over liabilities amounting to £769, but at the end of March of the current year there was a deficiency of £313. If the reserve for bad debts, &c., was taken into account, however, there was still an excess of assets over liabilities at that time. The company commenced to make receiving sets, but the profits did not cover the losses incurred on the transformers. Also, the turnover during last summer fell very considerably, and after discussing the position the directors were advised that there was no other course but liquidation. The directors of the company were Messrs. W. F. and E. C. Harkness, and they were also connected with the Electrical Appliance Company, and that company had advanced money week by week in order that wages and the necessary expenses could be paid. It was decided to confirm the appointment of the present liquidator. An informal committee, consisting of the representatives of the Celestion Radio Co., the Lithanode Co., Ltd., and Wingrove and Rogers, was also nominated to confer with the liquidator. The creditors include:—

	£		£
Scott Insulated Wire Co.	306	Marconi Co.	500
McLeod & McLeod ...	516	Person & Son	617
Lithanode Co., Ltd. ...	265	American Hard Rubber Co.	150
Gilbert Advertising Co.	440	Celestion Radio Co. ...	532
Wingrove & Rogers ...	85		

V. A. AYLIFFE, LTD., electrical contractors, Manchester.—The statutory meeting of creditors was held last week at Manchester. Mr. A. T. Bowden, 29, Corporation Street, Manchester, reported that the liabilities were £482, and the net assets £190, leaving a deficiency of £292. The issued capital of the company was £100, all of which was fully paid. It was registered on December 3rd, 1926, and commenced a new business. No directors' fees had ever been paid, and the present position was attributed to losses incurred on contracts, and to general trade depression. A resolution was passed confirming the voluntary liquidation of the company with Mr. Bowden as liquidator. The following are creditors:—

	£		£
Gratrix, Saml., Jnr., and Bros., Ltd.	81	Holt Electric Supplies ...	32
Macintosh Cable Co. ...	52	Lee & Swindells	24
General Electric Co., Ltd.	37	Philips Lamps, Ltd. ...	22

AEONIC WIRELESS CO., LTD.—A meeting of creditors was held on November 28th, at the liquidator's offices. Particulars of claims by December 20th to the liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C. (This notice is purely formal; all creditors have been, or will be, paid in full.)

Dissolutions of Partnership.

ALDRICH & EDWARDS, electrical contractors, 13b, Ram Yard, Round Church Street, Cambridge.—Mr. F. H. Aldrich and Mr. G. H. Edwards have dissolved partnership. Debts will be attended to by Mr. F. H. Aldrich at 13b, Ram Yard, or Mr. G. H. Edwards, at 93, King Street, Cambridge.

The MIDLAND ELECTRICAL CO.—Messrs. W. P. Young and A. D. Pochin, trading as wholesale factors at Leicester, have dissolved partnership. Mr. Pochin will attend to debts, while Mr. Young will continue the business under the same style.

ANDREW CHALMERS & MITCHELL, electrical and mechanical engineers, &c., Anderston, Glasgow.—Messrs. A. Chalmers and W. F. Mitchell have dissolved partnership. Mr. Chalmers will continue the business under the same style and attend to debts.

Standardisation in the United States.

Electrical Contracting (formerly *The Electragist*) states that householders may now move from any part of the United States to almost any other part of the country with the certainty that their household electrical devices can be used equally well in the new home. This is due to the standardisation of voltages which has been going on for some years. According to the National Electric Light Association, 90 per cent. of all the current used in residences in the United States is now of one voltage.

Export Credits Guarantee Inquiry.

The Secretary of the Department of Overseas Trade has appointed the following committee to inquire into the administrative expenses of the Export Credits Guarantee Scheme and other matters related thereto: Sir Otto Niemeyer, G.B.E., K.C.B. (chairman), Col. the Hon. Sidney Peel, D.S.O., and Sir William Plender, Bt., G.B.E. The Committee is "To consider generally the administration of the Export Credits Guarantee Scheme in the light of the recommendations of the Select Committee on Estimates on the Export Credits Guarantee Department, and to recommend what changes, if any, are necessary in the present system of administration and the presentation of the accounts, and to suggest any changes in the general working of the scheme which are likely to facilitate final transference of the business from Government control." The secretary will be Mr. H. J. Holford-Stevens, Export Credits Guarantee Department, 9, Clement's Lane, Lombard Street, E.C.4.

New French Companies.

Among the companies recently formed in France are the Société des Constructions Electriques du Languedoc (14, Rue Roquepine, Paris) with a capital of 1,800,000 fr.; and La Société des Accumulateurs Slens (31, Rue Lafayette, Paris), capital 2 million fr.

A company has been formed in Paris (19, Rue de l'Amiral Roussin) with a capital of 300,000 fr., and the title La Société de l'Energie Electrique de Noirmoutier, to establish an electric power station on the island of Noirmoutier, in the Bay of Biscay.

New Belgian Company.

La Société Belge d'Electrochimie is the name of a concern which has lately been formed in Brussels with a capital of 21 million francs.

For Sale.

Chesham Electric Light & Power Co., Ltd., has for disposal one 1,000-kW Willans-Siemens turbo-generator with condensing plant. The stores purchasing agent of the Western Union Telegraph Co. invites offers for surplus motors, switchboards, and one distribution fuseboard. Hastings Corporation Electricity Department invites offers for two d.c. dynamos, two switchboards, and two storage batteries. (See our advertisement pages to-day.)

Trade Announcements.

Messrs. BUGLASS & JAMIESON, LTD., have removed to new premises at 1, Tally Street, Nethergate, Dundee, where they have opened new showrooms, specialising in radio. They have been appointed service agents for "Pye" apparatus and "Exide" batteries.

Messrs. GEORGE ELLISON state that their Newcastle and district branch office has been transferred to "Carliol House," Newcastle-on-Tyne; the telephone number, Central 1325, and the telegraphic address, "Starters," are not altered.

Mr. J. RAINE announces that he is carrying on the business of William Raine & Son, electrical wiring contractors, &c., at 18, Houndgate, Darlington.

Mr. J. MARTIN BLAIR, Audrey House, Ely Place, E.C.1, has been appointed British representative for the engines manufactured by the Red Wing Motor Co., Minnesota. The engines are suitable for driving compressors, generators, &c., and range from 5 to 150 h.p.

Messrs. NUTTER, SON & EDGE, LTD., Cromford Court, Manchester, have opened new stores and trade counter at 2, Victoria Bridge, Salford, where a large stock of electrical accessories and "Belling" fires and cookers is being maintained. The company represents Messrs. Hopkinsons and the Foster Engineering Co., Ltd.

The NORTH SOMERSET ELECTRIC SUPPLY CO., LTD., is removing on December 3rd to more central and larger offices at Bower Ashton, Ashton Gate, Bristol. (Telephone: No. 7101; telegrams: "Electrify, Bristol.")

The telephone numbers of Messrs. THORPE & BOSCO, LTD., 38, Broad Street, W.1, have been altered to Gerrard 8313-4 (day) and Streatham 8530 (night).

RINGSDORFF CARBONS (ENGLAND), LTD., has removed from 66, Victoria Street, S.W.1, to recently-acquired works and offices at Colindale Avenue, Hendon, N.W.9.

The BRITISH THOMSON-HOUSTON CO., LTD., has opened an additional trade counter at Crown House, Aldwych, W.C.2, the entrance being in Drury Lane. The telephone number is "Regent 8040," and the telegraphic address "Asteroidal, Estrand, London."

In our last issue we reported that a petition had been presented for the winding up of the Helikon Wireless Co., Ltd. Messrs. John Abrahams & Co., Ltd., 54, Red Cross Street, E.C.1, write to point out that this company is in no way connected with the Helikon Werk, Vienna, for which Messrs. Abrahams are sole British agents.

Lamp Price Reductions.

The TUNGSRAM ELECTRIC LAMP WORKS (GREAT BRITAIN), LTD., announces that the prices of its gasfilled lamps of over 150 W have been reduced.

The Prime Minister and Industrial Efficiency.

In the course of a speech at Glasgow last week, the Prime Minister spoke of the movement towards "rationalisation" in industry. He said that now was the time to call in the youth and ability of the nation in whatever class it might be found. The country could not watch with tolerance those inefficient parasitical directors on the boards of companies who would not remove themselves for the sake of rationalisation unless they were bribed to do so. "The inefficient will have to make room for the efficient, and by that rule alone can British industry go through times such as the present in which she is struggling for her existence."

American Activity in Brazil.

The vice-president of the Electric Bond & Share Co., a New York concern, formed to finance and supervise electrical enterprises, arrived recently in Rio de Janeiro from New York to investigate the position of the enterprises being conducted in the country by associated companies. He said, in an interview, that United States electricity concerns were going to expend 200,000 contos (roughly £5,000,000) for the development of their Brazilian properties.—*Reuter* (Rio de Janeiro).

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Nov. 27th.	Fortnight's inc or dec.
a	Acid, Oxalic ... ... per lb.	5½d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£35	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	8½d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£95 to £100	...
b	,, Wire ... ... per lb.	1/8 to 1/9	...
b	,, Sheet ... ... ,,	1/8 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—		
	Grade I ... ... per ton net.	£214	£8 inc.
	Grade II ... ... ,, ,,	£147	£5 inc.
	Grade III ... ... ,, ,,	£77	£1 inc.
c	Brass (rolled metal 9" to 12" basis) per lb.	10½d.	...
c	,, Tubes (solid drawn) ... ... ,,	1/- to 10½d.	...
c	,, Wire, basis ... ... ,,	10½d.	...
c	Copper Tubes (solid drawn) ... ,,	1/1½	½d. dec.
c	,, Bars (best selected) ... per ton.	£98	...
c	,, Sheet ... ... ,,	£18	...
c	,, Rod ... ... ,,	£18	...
d	,, (Electrolytic) Bars ... ... ,,	£75 5s.	20/- inc.
d	,, ,, Sheets ... ... ,,	£143 10s.	...
d	,, ,, Wire Rods ... ,,	£85 5s.	20/- inc.
d	,, ,, H.C. Wire per lb.	1 7/16d.	1/16d. inc.
f	Ebonite Rod ... ... ,,	2/8 to 2/6	...
f	,, Sheet ... ... ,,	2/8 to 2/6	...
n	German Silver Wire ... ... ,,	2/9	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India rubber, Para fine ... ... ,,	10½d.	½d. dec.
l	Iron Pig (Cleveland No. 3.) ... per ton.	75/-	9/- inc.
l	,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£22 1's.	5/- inc.
g	Mercury ... ... per bot.	£:2 5s. to £22 15s.	10/- to 15/- dec.
e	Mica (in original cases) small ... per lb.	3d. to 8/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings ,,	1/8½	...
p	,, ,, drawn bars & rods ,,	1/7½	...
p	,, ,, rolled strip & sheet ,,	1/8½	...
p	,, ,, wire... ... ... ,,	1/4½	...
o	Platinum ... ... per oz.	£16	...
d	Silicium Bronze Wire ... ... per lb.	1(3/4d.	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton.	£237 15s. to £238 5s.	£10 5s. inc.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
W. F. Dennis & Co.

In their letter dated November 24th, Messrs. James Forster & Co. state that the lead market displayed a firmer tone last week, which must be ascribed more to a better sentiment prevailing in other metals rather than to any increased demand from consumers. A large quantity of lead for early arrival from Australia has been declared against contracts, but this had no effect on prices, probably because most consumers are very bare of stock, and all lead arriving is urgently wanted. Considerable arrivals are expected during December, and as it is reported that shipments during November will be in the neighbourhood of 13,000 tons, supplies are likely to be pretty full in January also. There is little reason for a rise in prices in the near future, although no serious decline is looked for.

New Catalogues and Lists.

MESSRS. LACY-HULBERT & CO., LTD., Boreas Works, Beddington, Croydon.—List P.7, illustrating and describing a number of examples of the company's portable air compressors.

MESSRS. S. G. BROWN & CO., LTD., North Acton, W.3.—The "Brown Budget" for November, containing illustrated articles on Brown apparatus, including the "Electro-Megaphone" equipment.

The CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, S.W.1.—A mailing card advertising "Cambridge" thermo-electric pyrometers.

BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester.—An illustrated card containing an invitation to the company's London showrooms, Australia House, Strand, W.C.2.

The MANOR ELECTRIC OVEN AND FIRE CO., 303, High Road, Chiswick, W.4.—Three illustrated and priced pamphlets describing the firm's electric cooking and heating appliances.

LIGHTING TRADES, LTD. (incorporating J. & W. B. SMITH, LTD.), 30-31, Farringdon Road, E.C.4.—Catalogue No. 352, containing illustrations and prices of a wide variety of electric lighting glassware.

BRITISH INSULATED CABLES, LTD., Prescot, Lancs.—A leaflet advertising the company's overhead line construction work.

MESSRS. L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, W.C.2.—Two boldly-produced showcards advertising "Vio-Ray" artificial sunlight apparatus, and a small automobile engine heater.

MESSRS. FALK, STADELMANN & CO., LTD., 83-93, Farringdon Road, E.C.1.—Catalogue No. 609, containing illustrations, details and prices of "Efesca" outdoor lanterns, signs, floodlight projectors, &c.

SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38-39, Upper Thames Street, E.C.4.—Leaflet No. 249, illustrated in colour, giving particulars and reduced prices of decorative lamp outfits.

BATTERIES, LTD., Redditch.—List No. 1/27, describing the latest pattern of "Nife" nickel-iron-alkaline accumulator. Illustrated.

Social Event.

The first dance of the season of the G.E.C. Social and Athletic Club took place at Magnet House on November 9th. The Cricket Section of the Club, under whose auspices the dance was arranged, was congratulated on arranging so successful an evening.

Lighting and Power Notes.

Axminster.—STREET LIGHTING.—The Urban District Council has approved an agreement with the South Somerset Electricity Co. for the public lighting of the town.

Barnes.—LOAN.—The Urban District Council has applied for sanction to a loan of £10,500 for electricity purposes.

Bognor.—ELECTRICITY IN BULK.—A bulk supply of electricity is now being received by the Bognor Gas & Electricity Co. from Portsmouth, through Chichester, the price paid being an additional 5s. per kVA, and .08d. per kWh over and above that paid by Chichester to Portsmouth.

Bolsover.—ELECTRICITY SUPPLY.—The second section of the Urban District Council's scheme for the supply of electricity in its area has been completed, and the sub-station for the supply in the Shuttlewood district was formally inaugurated by the chairman of the Electricity Committee on November 24th. Electricity is purchased in bulk from the Staveley Coal and Iron Co., and is reduced at the sub-station to 250 V for lighting and 440 V for power. The cost of the scheme was £3,161.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—According to the *Electrical News*, preliminary construction has now commenced at Island Falls on the Churchill River, Suskatchewan, of the hydro-electric development of the Hudson Bay Mining and Smelting Company. This site, situated some 60 miles north of the Flin Flon mining camps, has an estimated capacity of 100,000 continuous h.p. under conditions of ordinary flow. The construction of a temporary power house will be commenced probably in January. This will house two 1,040-h.p. hydro-electric units that will supply power for construction purposes of the permanent generating station, which will have an initial installation of three 15,000-h.p. units under a 49-ft. head. Orders have been placed for all the equipment to be installed in both the temporary and permanent plants. When the permanent plant is in operation, the smaller units will be transferred to it and used as auxiliary machines.

The Calgary Power Company has ordered from the Canadian Westinghouse Company, Ltd., three generating units, costing approximately $400,000, which are to be installed at the new Ghost River power plant, delivery of the first unit to be made within thirteen months. Two of the units will have a capacity of 15,000 kW, and will operate at a voltage of 13,200. The third generator will have a capacity of 1,000 kW. Good progress on the construction work at the Ghost River site is reported. Work on the coffer dams is completed, and excavation work is being carried out on the south bank of the river, where eventually the southern end of the big dam will rest.

The East Kootenay Power Co. has prepared plans for the erection of a new 15,000-h.p. power plant at Phillip's Canyon, on the Elk River, and construction will be begun as soon as the necessary water lease has been obtained.

Canterbury.—ELECTRICITY SUPPLY.—The Lighting Committee is to lay a cable to the works of Messrs. Frank Cooper (Canterbury), Ltd., for power purposes at an estimated cost of £2,500, subject to the company's agreeing to pay a minimum charge of £400 per annum for ten years, and to the Electricity Commissioners' sanctioning the necessary loan. It is also proposed to relay the cable from Stone House to the Sanatorium at a cost of £1,000.

Chard.—INAUGURATION OF SUPPLY.—An electricity supply was switched on by the Mayor on November 20th for the South Somerset and District Electricity Co., Ltd., who are the authorised distributors for a considerable portion of the county. The company only obtained statutory powers in the early part of this year, but the electrification of Axminster, Chard, Chardstock and Forton has already been completed, or is nearing completion, and similar developments will follow in less populous areas. Arrangements have been made with Messrs. Salter & Stokes, Ltd., of Chard Junction, to supply electricity in bulk for distribution in the area. The "telephone" system of charges has been adopted. The resident manager is Mr. W. Hilder.

Continental. — PORTUGAL. — The Companhia Nacional de Viacao e Electricidade, of Lisbon, has recently applied for a concession to establish a 100,000-V power transmission line between that city and the hydro-electric station at Castelo do Bodo, on the River Zezere. The Companhia Union Electrica Portuguesa is also erecting a 60,000-V line, between Oporto and Coimbra.

ITALY.—What is claimed to be the largest hydraulic turbine so far constructed in Europe has been completed by the De Pretto-Escher Wyss Co., of Scio. It is of 50,000 h.p., and has been installed at the Galleto hydro-electric power station of the Società Terni per l'Industria e l'Elettricità.

FRANCE.—The French Ministry of Public Works has recently published the official report on the output of electricity in France during 1926. The total production in the country is given as 11,347,000,000 kWh. Power to the extent of 400,000,000 kWh was "imported" and 44,000,000 kWh "exported" to neighbouring countries, leaving a net available total of 11,703,000,00 kWh. The total production capacity of plant installed amounted to 6,343,000 kVA, of which 4,624,000 kVA was represented by steam-operated stations and 1,719,000 kVA by hydro-electric plant. The annual consumption of electricity per head of the population in France has steadily risen from 197 kWh in 1923 to 287 kWh in 1926, while for 1927 it is estimated at 300 kWh.

GERMANY.—The municipal power station at Stuttgart is to be extended at a cost of £190,000. A sum of £105,000 is also to be expended on extensions to the municipal power plant at Freiburg, Saxony.

Croydon.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to borrow £1,776 for sub-station buildings, £5,000 for mains, and £2,220 for sub-station equipment.

MAINS EXTENSIONS.—The Committee is to extend mains at a cost of £2,000

Ealing.—YEAR'S WORKING.—The report of the Finance Committee of the Town Council on the working of the electricity undertaking for the year ended March 31st last shows that there was a net profit of £12,236, an increase of £7,701 over the previous year. After adding the balance brought forward from the previous year and writing off certain capital expenditure, there remained a credit balance of £44,625. The expenditure on capital account during the year amounted to £58,240.

Faversham.—ELECTRICITY SUPPLY.—The Town Council has been informed by the Kent Electric Power Co. that it is unable at the moment to offer a price for a bulk supply of electricity that would make negotiations economically possible. The electrical engineer has been instructed to prepare a report on alternative means by which the Council can provide for the increasing load expected in the future.

Hull.—SUPPLY TO AERODROME.—The Corporation is to provide an electricity supply to the aerodrome of the Blackburn Aeroplane Co., Ltd., at Brough under a seven-years' agreement, and the estimated cost of the necessary extension is £4,498.

Largs (Ayrshire).—INAUGURATION OF SUPPLY.—An electricity supply for the district was formally inaugurated on November 17th by Mrs. McPhaden, wife of the Provost. The Council houses, which up to the present have been lit by oil lamps, are being wired for electric lighting.

London.—POPLAR.—*Year's Working.*—We have received from Mr. J. H. Bowden, general manager and chief engineer of the Borough Council electricity undertaking, a copy of his report, together with the abstract of accounts, for the year ended March 31st last. The total income amounted to £231,296, and working expenses were £142,984, leaving a gross profit of £88,312. The figures for the preceding year

were: Income, £232,275; working expenses, £174,551; gross profit, £57,724. To the gross profit was added revenue from other sources making a total of £89,290, and after payment of capital and other charges there was a net surplus of £1,900, as compared with a loss of £21,274 in the preceding year. The capital expenditure during the year amounted to £31,960, and the total now spent on the undertaking stands at £1,141,020. The sales of electrical energy increased from 35,269,483 to 36,372,747 kWh, and the maximum supply demanded from 15,800 to 17,370 kW. Consequent upon the station having been chosen as a "selected" station, further extensions, using powdered fuel, have been sanctioned by the Electricitly Commissioners and the Central Electricity Board.

ELECTRICITY CHARGES. — The Electricity Commissioners have informed the Highways Committee of the L.C.C. that the following standard charges for electricity of two companies have been determined by them:—South Metropolitan Electric Light and Power Co., Ltd.: Bulk supplies, 0.697d. per kWh; private consumers, an average charge for all supplies of 2.011d. per kWh. South London Electric Supply Corporation: Street lighting supplies, 1.577d. per kWh; private consumers, an average charge for all supplies of 2.562d.

Lyndhurst (Hants.). — INAUGURATION OF SUPPLY. — The chairman of the New Forest Rural District Council formally switched on an electricity supply for the district on November 16th. The supply is provided by the West Hampshire Electricity Co., and the resident manager is Mr. G. T. Garwood.

Morecambe.—CHRISTMAS ILLUMINATIONS.—The scheme of electrical illuminations along the sea front, which was a feature of the autumn carnival week, is to be repeated for the Christmas season, as a means of attracting holiday visitors.

Northern Ireland.—FINTONA, CO. TYRONE.—Steps are being taken by the Rural District Council of Omagh to have the town lighted by electricity. An arrangement will be entered into with the Omagh Electric Lighting Co. for the purpose.

BELFAST.—A new 18,750-kW turbo-alternator was formally set in motion by the Lady Mayoress at the Corporation's power station on November 22nd. The set was supplied by the Metropolitan-Vickers Electrical Co., Ltd., and the capacity of the power station is now 55,000 kW.

Peterhead.—ELECTRICITY SCHEME PROGRESS.—The electricity scheme is nearing completion, and it is expected that the Peterhead Electricity Supply Co., Ltd., will be in a position to supply electricity by the beginning of next year. Cables have been laid along the main streets. The charge will be 9d. per kWh for lighting and 2½d. per kWh for power and heating.

Preston.—ELECTRICITY SUPPLY—The Electricity Committee has agreed to two additional lines being laid along the existing road to Blackpool, to afford an increased supply, at an estimated cost of £93,000, exclusive of switchgear building. The Committee also recommend the acceptance of tenders for £14,508 for overhead cables, £28,244 for underground cables, and £35,093 for transformer plant. Each Corporation will bear one half of the cost and also share the cost of the switchboard.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

GLOSSOP.—*The Urban Electric Supply Co., Ltd.*—Lighting: 8d. per kWh. Power: First 3,000 kWh per quarter, 4d. per kWh; next 15,000 kWh, 2½d.; over 18,000 kWh, 2d.

WALTON-ON-THAMES.—Lighting: From 9d. to 7½d. per kWh. Heating and cooking: From 4½d. per kWh for the first 100 kWh, and 3½d. beyond, to 2d. per kWh. Power: Varying from 6d. per kWh for the first 100 kWh to 2½d. for over 3,100 kWh.

HENDON.—*The Hendon Electric Supply Co., Ltd.*—Lighting: 3½d. per kWh. Domestic purposes, other than lighting, for all heating and power installations up to 2 kVA: First 120 kWh per quarter, 2½d. per kWh; additional energy, 3d. per kWh. Industrial purposes, other than lighting and exceeding 2 kVA, but not exceeding 150 kVA installed, or 75 kVA of maximum demand: 1½d. per kWh, or alternatively a fixed charge of 10s. per b.h.p. installed, plus ¾d. per kWh. Domestic tariff for all purposes: A fixed quarterly charge, plus ¾d. per kWh. Business tariff for lighting: A quarterly charge plus 1½d. per kWh.

Runcorn.—ELECTRICITY SUPPLY.—The refusal of the Electricity Commissioners to allow the Warrington Corporation to extend its area of electricity supply to five parishes in the immediate neighbourhood of the borough, and the decision to grant facilities to the Mersey Power Co., Ltd., has again engaged the attention of the Rural District Council, and it has decided to protest against the proposal of the Commissioners under which the residents in the parishes mentioned will be required to pay an unnecessarily high price for supplies of electricity. The Commissioners are also to be requested, in view of the fact that the Mersey Power Co. will continue to enjoy a monopoly of supply within the whole of the Council's area outside the existing limits of supply of the Warrington Corporation, to require the company to extend its compulsory mains within the Council's area so as to provide an electricity supply to all parishes within the area, and to limit the time for the carrying-out of the extensions to a period of two years.

Special Orders.—Applications have been made to the Electricity Commissioners by the Sutton Gas Co., Ltd., for a Special Order authorising it to supply electricity within the urban district of Mablethorpe and Sutton, and by Tonbridge Urban District Council for an Order to amend the Tonbridge Electricity (Extension) Special Order so as to include the parishes of Tonbridge Rural and Hadlow.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising Marple Urban District Council to supply electricity in its area, and Stepney Borough Council to acquire land for extensions to Limehouse generating station.

United States.—ELECTRICAL DEVELOPMENT.—Work has commenced on the erection of the new 60,000-kW steam generating plant in Pittsburgh of the Duquesne Light Company, one of the Standard Gas & Electric Company group of utilities. The new station is to be known as the James H. Reed Power Station. According to *Power*, the station will be adjacent to the Duquesne Light Company switch-house and near the present power station on Brunot Island, and the cost of the initial installation will be approximately $9,000,000. The power house building will be able to accommodate two 60,000-kW turbo-generators and six boilers, but at present only one 60,000-kW unit and three boilers will be installed, provision being made for further extension to the station. It is estimated that the completed station will cost approximately $13,500,000.

Tramway and Railway Notes.

Australia.—MELBOURNE.—*The Electrical Engineer of Australia and New Zealand* gives some statistics of the working of the Melbourne electric railways and tramways for the year ended June 30th last. On the electrified system of the suburban railways the passenger train mileage was 7,374,517, as against 7,358,600 in the preceding year, and the passengers carried totalled 156,393,635, as compared with 160,154,499. The passenger earnings amounted to £2,818,489, as against £2,880,117. In this service the department has 861 coaches, some of which are motor-equipped and some of which are trailers. For suburban goods service there are five light parcels vans and two electric locomotives. Approval has been given for the construction of seven additional locomotives, and these are being designed and built by the department. For the overhead equipment of goods sidings a new type of mast structure, built up from old rails, is being employed. Electrification is being extended from Diamond Creek to Hurstbridge, and a mercury arc rectifier for supplying this extension is being installed. The Elwood sub-station has been converted to automatic operation with supervisory control from Jolimont, the Glenroy sub-station has been converted to automatic operation, and the Seaford sub-station is in course of conversion.

The car miles run on the St. Kilda-Brighton tramway was 566,243, and the number of passengers carried, 5,561,619. The gross revenue was £55,202, working expenses £46,661, and interest £9,525. There was therefore a loss of £984.

The revenue from the Sandringham-Beaumaris tramway amounted to £15 076, and working expenses were £14,838. After providing for interest there was a loss of £6,575. The number of passengers carried was 1,716,524, and the car mileage was 189,785.

Continental. — CZECHO-SLOVAKIA. — It is reported from Prague that the electrification of the railway between Reichenberg and Gablonz is to be undertaken by a group of five firms, *viz.*, the Skoda Co. of Pilsen, the Bohmisch-Mahrische Maschinenfabrik, the Brown-Boveri Co., the Siemens Co., and the A.E.G.

Heywood and Middleton.—LIGHT RAILWAYS ORDER.—Public notice has been given of the intention of the Heywood and Manchester Corporations and the Middleton and Manchester Corporations to enter into agreements for the construction by Manchester Corporation of light railways Nos. 1 and 2, authorised by the Heywood and Middleton Light Railways Order, 1927, and for the leasing to Manchester Corporation of these railways for a period of 30 years from May 25th, 1928.

Japan.—TOKYO.—The Tokyo Underground Railway Co., with a capital of £2,000,000, has obtained a concession for constructing and operating a system of underground electric railways in the Japanese capital. The first section to be built has a length of 1¼ miles and runs from the Uyeno railway station to Asakusa Park in the crowded, poorer districts of Tokyo. The actual construction contract was let to a large Japanese firm which is now bringing this section to completion. It is probable that owing to unfavourable financial conditions the construction of the entire system planned will take some

years. The programme ultimately provides for 41 miles of electrically-operated underground railways at a total cost of £18,700,000.

London.—L.C.C. TRAMWAY EXTENSION.—The extension of the L.C.C. tramway to Grove Park was recently opened for traffic.

Tramway Operating Statistics.—Mr. W. D. Sheers, lecturing last week before the Sheffield Sub-Centre of the Institution of Electrical Engineers, gave statistics to show that tramways were by no means obsolete. In the last financial year, he pointed out, the tramway departments of seventeen provincial boroughs returned surpluses amounting to £1,830,069. Concerning cost, safety, reliability, speed, comfort, and convenience of the public generally, the advantage was unquestionably with the tramways, compared with motor omnibuses. The tramcar always occupied the road, could not skid, and had a lifeguard; 'buses and coaches caused 266 fatal accidents per million passengers, while tramcars and trolley 'buses caused only 0.0244 fatal accidents.

Southend on-Sea.—ADMINISTRATION.—At a recent meeting of the Town Council it was decided to form a separate Committee and appoint a manager to control the tramway undertaking.

Telegraph and Telephone Notes.

Dutch East Indies.—NEW RADIO TRANSMITTER.—A Bill has been introduced in the Dutch Parliament for extending various items in the Dutch East Indian Budget for 1928. One of the principal items consists of an increased credit of 330,000 florins (£27,500) for the Post and Telegraph Department to cover expenditure in the East Indies, including 75,000 florins (£6,250) as the first instalment towards the cost of erecting a powerful short-wave transmitter with a capacity of 600 kilowatts, which will permit of five direct wireless telegraph connections with Europe and simultaneously two or three wireless telephone connections during a period of from eight to ten hours per day. The estimated total cost of the new installation, which it is hoped to complete by January, 1930, will be 980,000 florins (over £80,000). It is also proposed to erect installations for short-wave traffic with America, for which in 1929 a further expenditure of 300,000 florins (£25,000) will be necessary.—*Reuter* (Amsterdam).

France.—RADIO AND CABLE MERGER.—A merger of the radio and transatlantic submarine telegraph services is reported to be impending in France somewhat on the lines of the merger proposed to be carried into effect in Great Britain. Radio France, which controls radio communication with Britain, Austria, Spain, Rumania, Norway, Yugo-Slavia, and Czecho-Slovakia, and is attempting to establish communication with the United States through the Saint Assisi station, is reported to be negotiating an agreement with the French Cable Company, which controls the cables to the United States *via* the Azores. The French Cable Company controls what was formerly the German cable from Emden to New York. It was cut during the war, tied up to the Brest cable, and later awarded to the French Government by the Treaty of Versailles. The proposed merger is regarded as the reply of France to the British proposals and the extensive schemes in the United States for the concentration of radio and cable communication under one control.

Greece.—TELEGRAPHY.—According to the recently issued official report for 1926 there were 11,600 miles of telegraph lines in operation in Greece at the end of that year, 1,843 miles running along the railways and the remainder along the roads. The lines represented a total length of wire of 29,963 miles.

TELEPHONY.—The country's telephone system extended to 257½ miles of urban and 1,646 miles of interurban lines, the total length of telephone wires in use being 10,234 miles.

P.O. Overhead Lines.—STORM DAMAGE.—With reference to the damage caused to overhead telephone and telegraph lines by the recent gales, which caused great dislocation, the Postmaster-General has written to *The Times* as follows, *inter alia*: "Your leading article . . . does less than justice to the standard of pole line construction adopted by the Post Office . . . reports of the engineers shows that the damage caused by the direct effect of wind pressure upon poles and wires was practically nil. In almost every case in this country the interruption was due to damage either by falling trees, or occasionally by dismantled roofs and broken chimneys, and in the case of the French circuits to a subsidence in a French road, which broke the underground cable."

The Marconi "beam" wireless-telegraph stations successfully withstood the test of the heavy gales. The safety devices included in the design of the aerials worked perfectly, and where interruption in the wireless services took place it was due to interruptions in land-lines and not to damage to the stations themselves, which were able to communicate between themselves throughout the gales. The aerial wires, which are normally tightly strained, are so arranged that when the wind reaches hurricane force and undue strain is placed on the masts, the tension of the wires is automatically reduced at their lower ends.

South Africa.—AUTOMATIC TELEPHONY.—Within a fortnight of the dismissal of Mr. Madeley, the Labour Minister of Posts, for having defied the Prime Minister and received a deputation from the Industrial and Commercial Workers' Union, a native organisation, with reference to wages and conditions of native post-office servants at Johannesburg, his successor, Mr. H. W. Sampson, removed the embargo placed by him on the installation of automatic telephones by private firms. The Postmaster-General circulated the firms concerned notifying them of Mr. Sampson's decision, which is likely to cause the greatest satisfaction among business men whose representatives in the Assembly had repeatedly attacked Mr. Madeley's attitude.—*Reuter* (Johannesburg).

The Telephone Service.—LONDON SERVICE.—There are 603,760 telephones in use in the London area, an increase of 46,300 for the year. The 130th telephone exchange is now in operation in London, whilst 37 additional centres are under construction.

Venezuela.—AUTOMATIC TELEPHONY.—It has been decided to construct an automatic telephone system at Maracaibo, capital of the State of Zulia. Lines will also be laid to link the districts of Tovar, Rivas, Dávila, and Sucre (in the State of Mérida) and others to Jauregui and Uribante (in the State of Tachira); the latter system will be 160 miles long.—*Reuter's Trade Service* (Caracas).

Radio Notes.

Battery Eliminators. — MIDDLESBROUGH.—The announcement of the *Wireless World* (quoted in our November 16th issue) that the Corporation Electricity Department was manufacturing radio-receiver battery eliminators for sale to its consumers on the instalment system was not correct. It appears that, although they have been designed under the direction of the Corporation, the outfits are being supplied by a well-known manufacturer of wireless and electrical apparatus and are being purchased by the Corporation at standard trade prices.

"Broadcasting House." — NEW HOME FOR THE B.B.C. —Arrangements have been completed for the transfer of the headquarters of the British Broadcasting Corporation from Savoy Hill to Portland Place, Oxford Circus, London, as soon as a new building is ready on a site of an area of about 20,000 sq. ft. The new building will provide more than 100,000 sq. ft. of useful floor space; some office space and some ground-floor shop space will be available on short lease, to be recovered later if necessary. Of the nine studios, four will be more than double the size of the largest studio at Savoy Hill, which is 44 ft. by 25 ft.; in addition, there will be a super-studio, three storeys high, of approximately 4,000 sq. ft., which, together with its gallery, will be capable of accommodating an audience of 1,000 as well as a large orchestra. The studios and their suites will be grouped one above the other in a central tower of heavy brickwork, ventilated artificially and protected from street noises by the complete outer layer of offices. Wide corridors and thick brick walls will insulate the studios from the offices, and in order to eliminate sound interference, the central tower will not contain vertical steelwork. The estimated cost is between £400,000 and £500,000, and it is hoped that the building will be ready for occupation in 1931. The enterprise is being financed by a syndicate on terms favourable to the B.B.C., which retains an option to purchase if and when it appears desirable to do so.

Regional Stations. — NORTHERN PLANT. — Capt. P. P. Eckersley, chief engineer of the B.B.C., in an address at Huddersfield last week, said the site of the new northern regional broadcasting station had not yet been definitely fixed, but it might be at Barkisland, a few miles north of Huddersfield. The suggestion that the new station would wipe out all the other stations in the northern area was not altogether justified.

SOUTHERN PLANT.—The walls of the southern station are now *in situ*, and it is hoped to complete the bulk of the constructional work by January, 1929.

ALTERNATIVE STATIONS.—The closing down of the Nottingham station (5NG) this month resulted in complaints by local listeners that the Daventry experimental transmitter (5GB) was appreciably weaker than the displaced local plant. When the Birmingham station (5IT) ceased to function, similar dissatisfaction was traced to result from defective receivers rather than faulty transmission.

Relay Stations.—SCHEME POSTPONED.—The British Broadcasting Corporation announced some two months ago that during November and December ten relay stations would take over the national exclusive frequency of 1,040 kilocycles (288.5 metres), replacing the international common frequencies which they shared with stations abroad. The necessity, how-

ever, of installing elaborate apparatus has led to the postponement of the scheme, and it is now announced by *The Times* that it will not come into operation until the early spring.

United States.—CONTROL OF WAVE-LENGTHS.—An automatic device is to be used by the Federal Radio Commission to keep broadcasting stations in their assigned channels. Mr. Arthur Batcheller, Federal Radio Supervisor for New York, says that "secondary standards" are to be installed in the subtreasury at New York and in the Custom House at Boston, which will show visually when a broadcasting station is deviating from its allotted wave-length and the extent of deviation; only 500 cycles of variation is permitted. Mr. Batcheller said that a "primary standard" for the entire country is to be established at some convenient point within the United States, and eventually "secondary standards" would be installed in all district offices of the department.—*Reuter* (New York).

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—December 18th. Department of Posts and Telegraphs. Motor-generator sets. (B.X. 4810.)* Lamps, lamp caps and sockets. (B.X. 4918.)*

January 8th. Switching equipment and relays (A.X. 4880);* fuses, heat coils, and arrestors (B.X. 4881.)*

January 15th. Telephone transformers. (B.X. 4878.)* Coil pots. (B.X. 4879.)*

January 22nd. Telephonists' telephones. (B.X. 4888.)* Telephone transmitters and parts. (B.X. 4889.)* Telephone receivers and parts. (B.X. 4890.)*

December 12th. Victorian Railway Commissioners. D.c. polarised relays. (B.X. 4886.)*

January 16th. Rotary convertor or rectifier set for Glen Waverley sub-station. (B.X. 4893.)*

February 4th. State Electricity Commission of Victoria. 11,000-V switchgear for Yallourn Power Station. (B.X. 4897.)* 11,000-V and 22,000-V switchgear and accessories for Richmond. (B.X. 4898 and 4901.)*

January 14th. 11,000-V transformers and spares. (B.X. 4900.)*

Barnoldswick.—December 15th. Urban District Council. Complete electricity distribution scheme. (November 23rd.)

Bromley (Kent).—December 12th. Borough Council. Electrical wiring of 91 houses on the Southborough housing site. (See this issue.)

Denmark.—COPENHAGEN.—December 4th. Lighting Department. One 10,000-kVA transformer. (B.X. 4862.)*

Dublin.—December 10th. Electricity Department. E.h.p. switchgear and accessories. (November 16th.)

Ely.—December 1st. Rural District Council. Electric lighting installation (plant, battery, cables, &c.) for the pumping station and engineer's house. (November 16th.)

London.—CENTRAL ELECTRICITY BOARD.—January 4th, 1929. 132,000-V transformers in connection with the South-East England Electricity Scheme, 1927. (November 2nd.)

December 17th. Central Scotland Electricity Scheme. Oil filtering and storage equipment for 13 outdoor transforming stations. (See this issue.)

ISLINGTON.—January 2nd. Electricity Department. E.h.p. switchgear and accessories. (November 23rd.)

January 18th. One 5,000-kVA and one 375-kVA or one 750-kVA Scott connected transformers. (November 23rd.)

New Zealand. — WELLINGTON. — February 12th. Public Works Department. 110-kV switchgear and controlling equipment for Waitaki electric power scheme. (B.X. 4848.)*

March 5th. Seven 5,500-kVA single-phase transformers. (B.X. 4873.)*

January 15th, 1929. Posts and Telegraph Department. Telephone cords. (B.X. 4847.)*

Preston. — December 12th. Electricity Committee. 60,000 tons of fuel for Ribble power station, Penwortham, during 12 months ending December 31st, 1929. Specification from Mr. J. F. Simpson, borough electrical engineer.

Prestwich.—County Mental Hospital. Steam and electrical cooking apparatus, &c. (See this issue.)

Salford.—December 8th. Installation of fire alarm systems at the Public Health Department and at Salford House. Specifications from Medical Officer of Health, 143, Regent Road, Salford.

December 6th. Electricity Department. One 1,000-kVA and two 1,500-kVA 3-phase transformers. (See this issue.)

South Africa.—JOHANNESBURG.—December 13th. Department of Posts and Telegraphs. Solder, copper wire and cable. (B.X. 4799.)*

December 20th. Telegraph materials. (C. 2900.)*

Town Council. December 20th. Electrical equipment for tramcars and supply of tram trucks. (A.X. 7113.)*

January 10th. South African Railways and Harbours. Five electrically-driven traversers and one 5-ton hand-operated overhead travelling crane. (A. 7170.)*

STELLENBOSCH.—December 4th. Municipal Council. Transformers, motors, fans, switchgear, and meters. (B.X. 4864.)*

DURBAN.—December 8th. Tramways Department. Four pairs of equal wheel bogie trucks for four motor equipments; four four-motor tramcar equipments; tramcar saloon and top deck seats. Specification from Messrs. Webster, Steel & Co., 36, Leadenhall Street, E.C.

Southend.—December 31st. Light Railways and Electricity Department. 3,000 joint boxes. (See this issue.)

Stockton-on-Tees.—December 10th. Electricity Department. Supply of paper insulated cables. (See this issue.)

Stretford.—December 11th. Urban District Council. Three 10,000-kVA three-phase transformers. (November 23rd.)

Turkey.—ANGORA.—December 18th. Post, Telegraphs and Telephones Department. 50,000 metres of rubber-covered field-telephone wire. (B.X. 4849.)*

Woking.—December 10th. Surrey County Council. Electrical wiring and fittings for the Brookwood Mental Hospital reception block. Mr. E. Lancaster Burne, engineer, 28, Victoria Street, Westminster (returnable deposit of £3 3s.).

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Crowland.—Holland Education Committee. Accepted:—Electrical wiring and fittings at South View Road and Postland Road Schools, Crowland.—H. Worton.

Egypt. — STATE RAILWAYS. — *Correction.*—In a list of tenderers for cable given in our issue of November 16th (p. 854) the name of the Kabelfabrik und Drahtindustrie, Vienna, was incorrectly given as "Kabelwerk Vieniz."

Government Contracts.—The following contracts were placed by Government Departments during October:—

ADMIRALTY CONTRACT AND PURCHASE DEPARTMENT.

W/T amplifiers.—H. W. Sullivan, Ltd.
Branch breakers.—Whipp & Bourne, Ltd.
Distribution boxes.—Pinnacle Switchgear & Fuse Co.
Carbon brushes.—Morgan Crucible Co., Ltd.
Electric cable.—W. T. Glover & Co., Ltd.; Johnson and Phillips, Ltd.
Electric jib crane.—Cowans, Sheldon & Co., Ltd.
Electric wharf crane.—Sir Wm. Arrol & Co., Ltd.
Cubicle and switchboard.—Crompton Parkinson, Ltd.
Motor generator and starter.—Metropolitan-Vickers Electrical Co., Ltd.
Motors, generators, and boosters.—Newton Bros. (Derby), Ltd.; Mackie & Co., Ltd.
Low power motor generators.—Veritys, Ltd.
X-ray machines.—A. E. Dean & Co.
Projectors.—Sperry Gyroscope Co., Ltd.
Automatic telephone exchange.—Standard Telephones and Cables, Ltd.
Rotary blowers, motors, and controllers.—Reavell & Co., Ltd.

WAR OFFICE.

Dry batteries.—India Rubber, Gutta Percha & Telephone Works Co., Ltd.
Electrical stores.—General Electric Co., Ltd.

AIR MINISTRY.

Generating plant (Wittering).—Robey & Co., Ltd.
Motor alternators and control gear.—Electric Construction Co., Ltd.
Wavemeters.—H. W. Sullivan, Ltd.

POST OFFICE.

Protective apparatus.—Phœnix Telephone & Electric Works, Ltd.; Telephone Mfg. Co., Ltd.

Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; Ericsson Telephones, Ltd.; General Electric Co., Ltd.; International Electric Co., Ltd.; Standard Telephones & Cables, Ltd.; Sterling Telephone & Electric Co., Ltd.; Telephone Mfg. Co., Ltd.

Electric lighting apparatus.—Venner Time Switches, Ltd.

Cable.—British Insulated Cables, Ltd.; Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; W. T. Glover and Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson and Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones and Cables, Ltd.

Joint box castings.—General Foundry & Engineering Co., Ltd.; United Steel Companies, Ltd. (T. Bullen & Co.).

Loading coils.—Standard Telephones & Cables, Ltd.

Telephone cords.—British Insulated Cables, Ltd.

Electric lamps.—General Electric Co., Ltd.

Insulating tape:—W. T. Henley's Telegraph Works Co., Ltd.

Wallboards.—H. J. Townsend & Son.

Manufacture, supply, drawing in and jointing cable, Manchester-Preston No. 2.—British Insulated Cables, Ltd.

Telephone exchange equipment.—Cwmbran and Newport (Mon.): Automatic Telephone Mfg. Co., Ltd. Derby: Standard Telephones & Cables, Ltd. Redhill: Ericsson Telephones, Ltd. Sub-contractors: Crompton Parkinson, Ltd. for machines; D.P. Battery Co., Ltd., for batteries. Lloyds Packing Warehouses, Ltd. (Manchester), "Illustrated London News" and "Sketch" (W.C.2), and London "Express" Newspaper, Ltd. (E.C.2): Relay Automatic Telephone Co., Ltd.

Telephone repeater station echo suppressors.—Leeds, Newcastle and Catterick: Standard Telephones & Cables, Ltd. Taplow, Marlborough, Taunton, and Gloucester; General Electric Co., Ltd.

Telephone repeater station, power plant (Blackpool).—General Electric Co., Ltd. Sub-contractors: Alton Battery Co., Ltd., for batteries.

CROWN AGENTS FOR THE COLONIES.

Cables.—British Insulated Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; W. T. Glover & Co., Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones and Cables, Ltd.

Electrical material.—Callender's Cable & Construction Co., Ltd.

Motors and switchgear.—Lancashire Dynamo & Motor Co., Ltd.

Rotary convertor.—Mather & Platt, Ltd.

Switchgear.—Ferguson, Pailin, Ltd.; Metropolitan-Vickers Electrical Export Co., Ltd.

Telephones.—Ericsson Telephones, Ltd.

H.M. OFFICE OF WORKS.

Electrical wiring (British Museum, London, W.C.).—Electrical Installations, Ltd.

Battery (Ministry of Labour, Carstairs).—Chloride Electrical Storage Co., Ltd. Generator, &c.—Blackstone and Co., Ltd.

Generator (British Legation, Teheran).—Blackstone & Co., Ltd.

High Wycombe.—Education Committee. Accepted:—

Installing electric lighting at the new schools at Terriers.—Wycombe Electric Light and Power Co., Ltd.

Irish Free State.—DUBLIN.—Department of Posts and Telegraphs:—

Electric light fittings, &c.—General Electric Co., Ltd.; W. T. Henley's Telegraph Works, Ltd.

—*Irish Electrician.*

Leicester.—Sewage Committee. Accepted:—

Electric lighting and auxiliary power supply at Abbey pumping station and Beaumont Lees Farm (£3,090).—James Kilpatrick & Son, Ltd.

London.—BATTERSEA.—Electricity Committee. Accepted:—

Switchgear for the 30,000-kW turbo-alternator (£3,982).—General Electric Co., Ltd.

CHELSEA.—Board of Guardians. Accepted:—

Electrical work at the nurses' home and the hospital chapel (£186).—T. Clark & Co., Ltd.

ST. PANCRAS.—Contracts and Stores Committee.

Two 750-kVA three-phase transformers for the supply to the London County Council dwellings in the Ossulston Street area:—

HACKBRIDGE ELECTRIC CONSTRUCTION CO., LTD.	
(Recommended.)	£649
Johnson & Phillips, Ltd.	672
British Thomson-Houston Co., Ltd.	691
English Electric Co., Ltd	696
Bruce Peebles & Co., Ltd.	705
Ferranti, Ltd.	710
General Electric Co., Ltd.	721
British Electric Transformer Co., Ltd.	738
Metropolitan-Vickers Electrical Co., Ltd. ...	794
C. A. Parsons & Co., Ltd.	798
Brush Electrical Engineering Co., Ltd. ...	804
Foster Engineering Co., Ltd.	818

Wiring and fitting 24 flats at Wicklow Street (£56).—H. J. Toms & Sons. (Contract prices varied from £56 to £101.)

Two positive and two negative l.p. switchboards for the Highgate sub-station:—

J. G. STATTER & Co. (Recommended.)	£388
General Electric Co., Ltd.	420
Ferguson, Pailin, Ltd.	424
Bertram Thomas	430
Edison Swan Electric Co., Ltd.	470
Johnson & Phillips, Ltd.	484
New Switchgear Construction Co., Ltd. ...	525
Whipp & Bourne, Ltd.	550
Park Royal Engineering Co., Ltd.	578
Nalder Bros. & Thompson, Ltd.	786
Metropolitan-Vickers Electrical Co., Ltd. ...	826
British Thomson-Houston Co., Ltd.	851

METROPOLITAN WATER BOARD.—Recommended:—

Electrical cable and fittings at Kempton Park waterworks:—

Standard Telephones & Cables, Ltd.	£810
W. T. GLOVER & Co., LTD. (Recommended.) ...	812
Macintosh Cable Co., Ltd.	813
W. T. Henley's Telegraph Works Co., Ltd. ...	817
British Insulated Cables, Ltd.	821
General Electric Co., Ltd.	824

ADMIRALTY.

Central control drums, springs and switch sockets.—Edison Swan Electric Co., Ltd.

LONDON COUNTY COUNCIL.

V.i.r. cables.—British Driver-Harris Co., Ltd.

Newport Pagnell.—Rural Council. Accepted:—

Installing electric light at Newton Longville, at £6 per house.—Northampton Electric Co.

South Africa.—CAPE TOWN.—Electricity Committee. Accepted:—

Reblading rotor and supplies for turbo-generators at Dock Road power station (£900).—Metropolitan-Vickers Electrical Export Co., Ltd.

Copper wire.—£4,336: British Insulated Cables, Ltd.; £3,011: Dowson, Dobson & Behr, Ltd.; £1,801: General Engineering Co.

Galvanised iron stay wire (£218).—Hubert Davies & Co.

Meters by Measurement, Ltd. (£981).—Associated Engineering Co., Ltd.

Scarborough.—Town Council. Accepted:—

Additional plant for the generating station (£46,302).—International Combustion, Ltd.

Forthcoming Events.

Junior Institution of Engineers.—Friday, November 30th. 39, Victoria Street, S.W. 7.30 p.m. "The Manufacture of Decorative Metal Work." Mr. C. W. Harvey.

Friday, December 7th. Royal Society of Arts, John Street, Adelphi, W.C. 7.30 p.m. Address by the president, Lt.-Col. J. T. C. Moore-Brabazon, M.P.

Association of Supervising Electrical Engineers.—Tuesday, December 4th. Junior Institution of Engineers, 39, Victoria Street, S.W. 6.30 p.m. "Some Aspects of the Electricity Act." Mr. W. S. Kennedy.

Electrical Society of Glasgow.—Tuesday, December 4th. Reid's Smoke Room, 30, Gordon Street, Glasgow. 7.30 p.m. "Electrical Marine Propulsion." Mr. W. G. Belsey.

Electrical Trades Commercial Travellers' Association.—Tuesday, December 4th. Hotel Cecil. Dinner-Dance.

Institution of Heating and Ventilating Engineers.—Wednesday, December 5th. Caxton Hall, S.W. 7 p.m. "Constant Pressure Thermal Storage." Mr. S. Hopkins.

Association of Consulting Engineers (Incorporated).—Wednesday, December 5th. St. Stephen's Club, Westminster. 7.30 p.m. Annual dinner.

Institution of Electrical Engineers.—Thursday, December 6th. Institution, London, W.C. 6 p.m. "The Continuously Loaded Submarine Telegraph Cable." Messrs. A. E. Foster, P. G. Ledger, and A. Rosen.

(Wireless Section).—Wednesday, December 5th. Institution, London, W.C. 6 p.m. "Attenuation of Wireless Waves over Towns (Effect of Towns, including Buildings, Tuned Aerials, &c., on Wave Damping)." Mr. R. H. Barfield & Mr. G. H. Munro.

(South-Midland Centre).—Friday, November 30th. Grand Hotel, Birmingham. 7 p.m. Annual dinner.

Monday, December 3rd. University, Birmingham. 7 p.m. "Practice and Progress in Combustion of Coal as Applied to Steam Generation." Mr. F. H. Rosencrants.

(East-Midland Sub-Centre).—Tuesday, December 4th. Technical College, Leicester. 6.45 p.m. "Polyphase Commutator Motors and their Application." Mr. H. Cotton.

(North-Western Students' Section). — Tuesday, December 4th. Engineers' Club, Manchester. 7.15 p.m. "A.c. Motor Testing." Mr. W. Kelly.

(North-Eastern Centre, Students' Section).—Friday, December 7th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "Industrial Electric Heating." Mr. G. H. Bowden.

Institution of Chemical Engineers.—Thursday and Friday, December 6th and 7th. Burlington House, Piccadilly, W. 10.30 a.m. Conference on "Drying."

Institution of Engineering Inspection.—Friday, December 7th. Royal Society of Arts, John Street, Adelphi, W.C. 5.30 p.m. "The Application of Electro-Deposited Metals to Engineering." Mr. C. H. Faris.

Nottingham Society of Engineers.—Friday, December 7th. Victoria Station Hotel. 7.30 p.m. Annual dinner.

Electrical Power Engineers' Association (West Yorkshire Section).—Saturday, December 8th. Great Northern Hotel, Wellington Street, Leeds. 5.30-6 p.m. Annual dinner.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

TROPICAL compound for joint boxes.

An engraving machine or similar device for marking such apparatus as kettles, irons, &c., let out on hire.

Notes.

The Cookery and Food Exhibition.

The 31st Universal Cookery and Food Exhibition was opened at Olympia on November 23rd, and will continue until December 1st. There is a good deal of electrical equipment to be seen, mostly of the larger type for use in hotels, &c. Messrs. Benham & Son, Ltd., are showing, in addition to fires and other electrical apparatus, a large electric oven measuring 46 in. high, 36 in. wide and 30 in. deep; it has side-bottom heating and a total loading of 19 kW, with double doors. The General Electric Co., Ltd., has on show a wide range of heavy-duty cooking apparatus, including various double oven ranges, a cabinet type roasting oven, hot cupboards with carving wells and bain-marie, a steaming oven; fish-frying outfits; the "Magnet" sandwich toaster; and a variety of smaller appliances. On the stand of Carron Company may be seen the No. 354 electric galley range—a large double-oven apparatus equipped with six boiling plates. Each oven measures 2 ft. 3 in. by 1 ft. 6 in. by 2 ft. 4 in. inside, and is loaded at 6 kW. Two boiling plates are loaded at 3 kW each and four at 2 kW each. On this stand is also a No. 410 electric griller and toaster, which has a loading of 8 kW, and stands at a convenient height on legs. This company also has working in connection with the exhibition a large central galley range on the stand of the Shipping Federation, Ltd. This apparatus has eight ovens, each loaded at 6 kW, 16 boiling sections with loadings of 2 kW each, 8 boiling sections each with 3 kW loading, a hot closet (3 kW) and a bain marie (6 kW). Included in a comprehensive range of heavy-duty equipment by Sadia, Ltd., is a particularly interesting all-enamelled cooker designed to meet the requirements of 500 people. It has a total loading of 54 kW taken by three ovens and 10 large boiling plates. The dimensions are 9 ft. long by 4 ft. 4 in. wide by about 3 ft. deep. The elements are constructed with external bus-bars (inside the outer casing), so that balancing can be arranged on 3-phase supply. The elements are wound on "steatite" bars, and the units can be removed separately. The drop-down doors are provided with air-cushioning devices. Messrs. Jackson Boilers, Ltd., are showing some interesting examples of their electrically-heated coffee-making machines. A novel electrical appliance which is being displayed by Messrs. Hector C. Adam, Ltd., is the "Auto-Grill" bacon griller. The rashers are placed in parchment paper and sandwiched between two element units during cooking. The top unit is hinged to the base of the apparatus. The loading is 900 W. A clockwork device permits the supply to be automatically switched off after a predetermined time. The main exhibit of Messrs. Belling & Co. is designed to push the sale of electric fires for installation in hotel bedrooms, the idea being to allow visitors to have control of the heating by means of slot meters. The proposition is calculated to be attractive to hotel proprietors. A number of firms are showing emulsifying equipment for "reconstructing" cream, including Messrs. Harben & Co. and Messrs. Fern's Emulsifiers, Ltd. It is claimed that 60 gallons of cream can be made for a consumption of 6 kWh. An electric dish washer on show by Messrs. W. M. Still & Sons, Ltd., is designed to meet the requirements of an ordinary hotel, and is equipped with a 1½-h.p. motor. Electric cleaners are being shown and demonstrated by many firms, including Hoover, Ltd., Electrolux, Ltd., the G.E.C., and the Hotpoint Electric Appliance Co., Ltd., while refrigerating equipment is scattered about all over the exhibition. Some of the firms displaying the latter apparatus are Messrs. Sulzer Bros.; Frigidaire, Ltd.; J. & E. Hall, Ltd.; Marco Refrigerators, Ltd.; Kelvinator, Ltd.; and Messrs. L. Sterne & Co., Ltd. Two interesting features which may be seen on Messrs. Sulzer's stand are the "Lenix" adjustable belt-tightening device, and a "plate" condenser on the cooling apparatus. In the latter the spaces between and around the cooling tubes are filled in with pressed-steel plates. K.F.M. Engineering Co., Ltd., is showing "Internalite" electric signs. The actual sign is etched in ¼-in. glass plate, and the illumination is provided edgewise through the glass from a tubular-type lamp. A special feature of the show by the Hotpoint Co. is a continuous demonstration of the "Maytag" washing machine and the "Hotpoint" ironing machine—the two machines being worked in conjunction. On this stand is also to be seen a wide range of heavy duty equipment, as well as some smaller appliances, such as grillers, toasters, cleaners and so on.

E.P.E.A. Dinner.

The West Wales section of the Western Division of the Electrical Power Engineers' Association held its seventh annual dinner last week. Mr. W. Riches, A.M.I.E.E. (chairman of the section) presided. The Mayor of Swansea (Councillor T. J. Richards), in proposing "The Association," wondered whether this country would follow South Africa in using electrical machinery for cutting at the coal face.

Mr. J. W. Essex, A.M.I.E.E. (assistant secretary) responded, and, speaking of the work of the National and District Boards, said they had not had a single local disturbance since the machinery had been established.

"The Electricity Supply Industry" was proposed by Col. Sinclair (chairman of the Swansea Corporation Electricity Committee), who said the vital necessity of the time was undoubtedly cheap electricity, and that depended upon coal.

Replying, Mr. J. W. Burr (Swansea borough electrical engineer) said that engineers who took charge of an electricity supply undertaking, particularly a power station, to-day had to be almost supermen, simply because they had such tremendous powers in their charge. The industry had a magnificent future. He predicted that in less than 10 to 20 years the output of the stations would be from 10 to 20 times larger than to-day. The health of the chairman was also heartily toasted.

The Batti-Wallahs' Society.

At a luncheon of the Society, on Wednesday last week, Sir Hamar Greenwood, Bt., K.C., M.P., was the principal guest; there were also present the Earl of Drogheda, Maj.-Gen. Sir P. Nash, K.C.M.G., C.B., Sir E. M. Hughman, and Lt.-Col. K. Edgcumbe, president, Inst.E.E. After the president, Mr. R. W. Hughman, had given the loyal toast and briefly introduced him, Sir Hamar, in the course of an address, said that electricity was one of the most hopeful industries in the country. The President-elect of the United States, Mr. Hoover, was about to visit every seaport in South America. He admired the aggressiveness which took American goods into some of our once best export markets, but a quarter of the world's human beings were British subjects, who wanted what we made and sold. Were we taking due advantage of this fact? He had always believed that the existence and strength of England depended on the development of our Empire, which had been neglected. The Germans were being put on equal terms with us in South Africa: were we to blame for not keeping in closer touch with that country? We had ample credit at command, and could increase production and employment—why were we not doing it? It was a matter, not for the individual, but for the Government. Our very existence depended on the improvement and increase of our industrial output; if we had a tariff wall our industries would have a better chance at home and abroad. The war killed all theories—we were up against the crude realities of existence; no amount of theory would add to employment. A large portion of our foreign markets had been lost during and since the war; mechanical skill was now universal, and our former industrial supremacy no longer existed, through no fault of ours. Half a million people were added to our population each year; they were not absorbed in our industries, and never would be till we developed the British Empire and its people to the utmost.

Acknowledging a vote of thanks, moved by Mr. W. McClelland, C.B., Sir Hamar referred to the wireless and cable telegraph merger, the result of an imperial conference, and said that the whole Empire was one in this matter—it would have seemed incredible a few years ago.

Association of Mining Electrical Engineers.

In his presidential address to the London Branch of the Association of Mining Electrical Engineers on Wednesday, November 21st, Mr. J. W. Robinson laid stress on the importance of the maintenance of individual effort supplementary to the work of the research organisations. Referring to the Safety in Mines Research Board, he said that during the year ended March 31st, 1928, £52,718 was expended by the Board on research work (apart from the building of research stations). The scheme of co-operative research with the United States

Bureau of Mines had matured on satisfactory lines, and he looked forward to co-operation in research being extended to Belgium, Germany, and France. He appealed for a freer exchange of ideas and co-operation among rival firms in the same industry, which could be attained in large measure by amalgamation, but he urged that it should not be used for price maintenance. Some firms had considered economy of sufficient importance to warrant the appointment of an executive member of the staff to devote the whole of his time and energy to that end. One of the channels of wastefulness was that of litigation; the amount of money and time expended in litigation in this country on questions which might be settled amicably by arbitration was alarming. He also urged the value of arbitration as a means of settling industrial strife. The scientific use and treatment of coal was one of the predominant needs in industry, and the World Fuel Conference had convinced the civilised world that the burning of raw coal was wanton waste. Some of the most modern superpower stations had reached the stage, which some fuel experts had been advocating for years past, at which they regarded the operation of steam boilers as a job for the highly trained chemical engineer. Extraordinary interest was centred also upon the development of low-temperature carbonisation, which must lead to important results in the near future. With the development of low-temperature carbonisation they could look forward to a new era in the mining industry.

The Health and Ironmongery Exhibitions.

A fair number of electrical firms took advantage of the wide scope offered to exhibitors at the Public Health Exhibition, which was run in conjunction with the Public Health Congress, and the Ironmongery, Hardware and Domestic Appliances Exhibition which were held at the Agricultural Hall, Islington, last week. The electrical exhibits were mostly of a domestic character. On each of two stands the General Electric Co., Ltd., showed a comprehensive range of domestic electrical appliances for cooking, heating, washing, cleaning, and so on, including the "Wizard" universal machine. Included in a wide range of electric cookers, fires and water heaters seen on the stand of the Jackson Electric Stove Co., Ltd., was a new No. 61 breakfast cooker. This is a small oven measuring 16 in. wide by 10 in. deep by 10 high with top heating elements which serve for a boiling plate on top, for grilling beneath, or for the oven. The loading is 1,800 W, and 3-heat regulation is provided. The Oatway Safety Heating Co., Ltd., showed a range of "Oatway" electric hot-water radiators, with loadings from 250 to 3,000 W. Some of the larger sizes were shown with glowing-fire attachments. Messrs. L. G. Hawkins & Co., Ltd., exhibited a good many electric table appliances—kettles, toasters, coffee percolators, and so on, in addition to cookers, washing machines and "Vio Ray" artificial sunlight apparatus. Electro-medical apparatus—largely ultra-violet-ray equipment—was shown by the Medical Supply Association, Ltd., and the British Hanovia Quartz Lamp Co., Ltd. The display by the former included equipment specially designed for use in welfare clinics, and by the latter a range of apparatus intended for scientific use. The Davies Manufacturing Co. showed some "Sunray" daylight and electric advertising signs, and also its electric washing machine and boiler combination. Electrically-driven kitchen machines, such as mixers, mincers, cutters and peelers, were on show on the stands of the Hobart Manufacturing Co., Ltd., and the "Peerless" Electrical Manufacturing Co., Ltd. An interesting exhibit by Electricars, Ltd., included a 30/40-cwt. low-loading electric vehicle specially designed for house refuse collection, and a lighter tradesman's vehicle for general delivery work. The former was equipped with a 40-cell Exide battery, and the latter with a similar 20-cell battery. Messrs. H. C. Slingsby showed electric trucks for various purposes. Refrigerators were exhibited by Electrolux, Ltd.; Marco Refrigerators, Ltd. Frigidaire, Ltd.; Kelvinator, Ltd. The "Electrolux" electric cleaner was also in prominent display. Electric cleaners galore were to be seen, and the following are some of the firms which showed them: Messrs. John Shaw & Sons (Wolverhampton), Ltd., who also displayed various "Trojan" domestic electrical appliances; British Vacuum Cleaner and Engineering Co., Ltd.; Vampires, Ltd.; Tellus Super Vacuum Cleaner, Ltd.; C. C. A. (Vacuum Cleaners), Ltd.; and Hoover, Ltd. The Ever-Ready Co. (Great Britain), Ltd., showed a comprehensive range of batteries, electric pocket lamps, signalling lamps, medical coils, wireless and automobile equipment, and so on. Standard Telephones and Cables, Ltd., displayed and demonstrated selections from their products. The "Standard" public address system was in use for the amplification of speeches during the exhibition. "Standard" telephone equipment included a small 21-line private automatic system, a unit-type private automatic system, an automatic branch exchange and the "Gamewell" fire alarm system.

Fatality.

An inquest was held at Croydon, on November 22nd, on the body of Charles Bird, aged 15, who died in the bathroom of his home. The boy's father said he entered the bathroom and found deceased standing in the bath with a bowl fire under his arm. He collapsed immediately. The distribution superintendent of the Corporation Electricity Department said that a small bush had become displaced, causing the insulation of the flex to be worn away, and allowing the conductor wire to touch the metal part of the heater when it was in a certain position. He did not think it was advisable to use any portable electrical apparatus in a bathroom. Under an Act of Parliament passed this year the local authority had power to prohibit the use of electrical apparatus in unsuitable places. Dr. Bronte, the pathologist, of Harley Street, said that death was due to heart failure caused by an electric shock. A verdict of "Death from misadventure" was returned.

B.E.S.A. Specification.

The British Engineering Standards Association has recently published B.S.S. No. 526, 1928, for the electrical performance of transformers for X-ray purposes. This is the first British Standard Specification to be issued dealing with X-ray apparatus. It applies to the main high-pressure transformers of X-ray installations, the subject being dealt with along lines very similar to the B.S.S. for the electrical performance of transformers for power and lighting.

The usual method of expressing the output of a transformer in kVA is departed from, as the intensity of the X-ray output is dependent upon the peak voltage rather than the r.m.s. voltage. The r.m.s. value of the current output is retained, however, as it is this value which determines the internal heating. In addition to the rating, the specification deals with the types of cooling, standard sizes, primary voltage, regulation, limits of temperature rise, and the quality of the insulating oil. The tests to be applied to the transformer are also included, one of which, the switching test, is of special importance in the case of X-ray transformers. The method of testing the output of X ray transformers is given special attention, and the specification concludes with some notes on rectification. Copies of the publication may be obtained from the Publications Department, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

The Institute of Fuel.

The annual dinner of the Institute of Fuel was held as usual on the evening of the first day of the annual conference, November 21st, at the Connaught Rooms, Kingsway. The Rt. Hon. Lord Melchett, P.C., president of the Institute, was in the chair, and after the loyal toast he announced that the Institute had just sent a telegram of greetings to the Carnegie Institute of Technology, which was holding a coal conference in Pittsburg.

The Rt. Hon. W. C. Bridgeman, P.C., First Lord of the Admiralty, proposed "The Institute of Fuel." He paid a tribute to Mr. Frank Hodges, J.P., chairman of the Council of the Institute, who, he said, had never lost sight of the welfare of the coal industry as a whole. The Admiralty was interested in the work of the Institute and was anxious, when possible, to help in its researches. If necessity was the mother of invention, then research was the father. In its successor to Lord Melchett the Institute would have a very able president in Sir David Milne Watson, LL.D.

In his reply, the president said that the change over to oil fuel by the navy was a great loss to the coal industry. The production of oil from coal was an accomplished fact and the use of the oil so produced was merely a question of cost. The Institute was now on a very secure foundation. In referring to his successor, he said that Sir David was a man with a life-long knowledge of the combustion of coal. He had written a paper for the Pittsburg conference and it was being read by a friend of his. The conference at Pittsburg was a very important one, and the proceedings would contain much valuable information for members of the Institute.

Sir David Milne Watson proposed "The Visitors." Referring to the suggestion that there were too many technical institutions and conferences to-day, he said that in these days of rapid development it was necessary to have all possible means of spreading information. The World Power Conference had shown what could be done in that connection. The Institute of Fuel conference was complementary to the larger conferences. Japan was well ahead in fuel matters, and he extended on behalf of the Institute best wishes to H.E. the Japanese Chargé d'Affaires, Mr. Sadao Saburi, whose name was coupled with the toast, for the next World Power Conference, which was to be held in that country.

In reply, Mr. Saburi said that his country desired to enliven the interest of engineers in this country in the conference to be held in Tokio. The people concerned in Japan would cordially welcome all members of the Institute, and particularly the contribution of papers. The conference would be an incentive to his country to double its efforts for international progress. The Japanese were anxious to have the co-operation of the men of science in this country—particularly the Institute of Fuel.

Lt.-Col. K. Edgcumbe, president, Institution of Electrical Engineers, also replied, and said that judging from the papers that were read at the conference that day, the fuel industry was becoming more and more dependent on the electrical industry. He thought the two institutions could do a great deal to further each other's work, and hoped that it would be possible at some time for the two bodies to arrange a joint meeting. He congratulated Lord Melchett on his success in merging the two original organisations from which the Institute of Fuel was formed. The formation of new societies was nearly becoming a disease.

The Rt. Hon. J. H. Thomas, P.C., in a delightful and humorous speech, proposed "The President." He said that

in 1914 this country had great wealth in its coal; to-day that wealth was fast declining. If organisations such as the Institute of Fuel could recognise the full significance of those facts —and face them—then they would do real work. He paid a great tribute to Lord Melchett on the success of his efforts to bring about co-operation between capital and labour.

After a suitable reply from Lord Melchett the members and visitors present adjourned to spend the rest of the evening in dancing.

Electric Traction on Railways.

In a paper under the above title, by Mr. R. Brooks, B.Sc., read before the Manchester Association of Engineers on November 23rd, the author discusses the application of electricity to the operation of suburban services and to specific types of main-line sections; the choice of system—a.c. or d.c.—is also considered. In his concluding remarks, he says it is certain that one of the main factors which has delayed the extension of electrical operation is the high capital cost of conversion. One prominent authority in this country recently gave a figure of £25,000 per mile of double track for a suburban system, the actual train equipments themselves being provided out of the locomotive renewals fund. The advantages to be obtained by electrification, therefore, must be sufficient to give an adequate return on the large capital expenditure involved. It is significant that extensive electrification work is being carried out, notably by the Southern Railway, and that the directors are satisfied that the scheme is economically justified. The other large railway groups in this country are also closely considering suburban electrification projects, and it is reasonable to anticipate developments in the larger city areas in the comparatively near future. Considerable development of suburban electrification has taken place in the British Overseas Dominions in recent years. In Australia, Melbourne has had an extensive 1,500-V system running for several years, and Sydney is installing a 1,500-V system, for which there are already in service or under construction over 450 motor coaches, besides trailers. In Africa, Cape Town has recently started up a 1,500-V suburban service of considerable size, while in India the Bombay, Baroda line and the G.I.P. Railway have both installed first sections of suburban electric trains at 1,500 V. It seems a reasonable conclusion that electrification provides a solution of the problem of heavy suburban requirements and that it will continue to do so for many years. So far as main lines are concerned, the situation is not so clear. It is certainly established that for heavy-grade sections with heavy traffic the electric locomotive is in advance of any means of haulage with the same track facilities, but the economic factor is a serious one if general electrical operation of the whole main-line system is considered. At any rate, no wholesale conversion can be expected, and the movement towards general electrification is bound to be slow. It is interesting to note the number of electric locomotives in use in different parts of the world. The following figures are only approximate, but may be taken as substantially correct :—

	D.c. Locomotives.	A.c. Locomotives.		Total.
		Single phase.	Three phase.	
North America ...	270	205	4	479
South America ...	80	—	—	80
Europe	420	735	500	1,655
Other countries ...	200	—	—	200
Total ...	970	940	504	2,414

Traffic Control in Edinburgh.

A recommendation to proceed with the installation of automatic electric traffic control signals at 16 additional crossings in the city, at an estimated expenditure of £2,000, was approved by the Edinburgh Corporation on November 22nd.

Appointments Vacant.

Technical assistant (£215) for the Admiralty. Shorthand-typist (male) for the Hackney Borough Council Electricity Department. Sub-station attendant for the Borough of Burnley Electricity Department. Mains assistant engineer (£457) for the Manchester Corporation Electricity Department. Assistant consumers' engineer (£288) for the City of Salford Electricity Department. Station engineers (£500) for the Government of Nigeria Public Works Department. Junior engineer in charge (£363) for the Hammersmith Borough Council Electricity Department. (See our advertisement pages to-day.)

More Slogans Wanted.

In our advertisement pages to-day the Wholesale Fittings Co., Ltd., is offering prizes for the best slogans for "Supastone" lighting glassware.

Liverpool and District Electro-Harmonic Society.

Last Friday evening the members of the Liverpool and District Electro-Harmonic Society held the second hot-pot supper and smoking concert of the season, the entertainment being provided by the Duds Concert Party. Mr. F. Crawford, Liverpool manager of the General Electric Co., Ltd., presided. In a short interval of speech-making, Mr. R. Pulford mentioned that the members of the Liverpool Society were invited to attend the next function to be held on December 14th under the auspices of the Manchester Electro-Harmonic Society. The Liverpool Society now has 150 members.

Electricity in Gas Works.

Mr. P. S. Hoyte, who recently retired from the post of engineer and manager of the Plymouth & Stonehouse Gas, Light & Coke Co., after 34 years' service, was responsible for the practical remodelling of the whole of the company's works, a feature of the equipment of which is that there are in use over 100 electric motors, an application of electric power which, in comparison with the output, few British gas undertakings, it is stated, can equal.

A Welding Conference.

Purdue University will hold its fourth annual conference on welding at Lafayette, Indiana, U.S.A., on December 12-14th; it will be devoted to the applications of electric, oxy-acetylene, and thermit welding to manufacturing and repair operations. Provision will be made for exhibits and demonstrations. Particulars may be obtained from the Engineering Extension Department, Purdue University, Lafayette, Indiana.

Institution Notes.

Institution of Electrical Engineers.

Portrait Presentations.—At the ordinary meeting of the Institution, to be held at 6 p.m. on December 6th, 1928, Sir George Sutton, Bt., will present to the Institution an oil painting of Wheatstone, by Sir William Llewellyn, K.C.V.O., R.A. At the same meeting there will be presented to the Institution by Mr. R. W. Paul an oil portrait of Volta, painted by Signor G. Palanti, of Milan.

Meter and Instrument Section.—The first meeting of the recently formed Meter and Instrument Section of the Institution will take place at the Institution on Friday, December 7th, 1928, at 7 p.m., when a paper by Mr. W. Holmes, entitled "Load-levelling Relays and their Application in Connection with Future Metering Problems" will be read and discussed.

Institute of Fuel.

The annual autumn meeting of the Institute of Fuel was held at the Institution of Electrical Engineers, London, on November 21st and 22nd. Lord Melchett (founder president of the Institute) delivered the presidential address for the third year in succession. He said that the problem with which the coal trade was faced was to tide over the present period of disorganisation and over-production in such a way that what might be called the legitimate output of coal, when used with the utmost economy, would satisfy the needs of the world. He had been told recently that one of the largest German steel works obtained its coke for nothing, because the price which could be obtained for the coke-oven gas and other by-products produced covered the cost of the coal and of its conversion into coke. It was obvious what a great economy that meant per ton of pig iron, and subsequently per ton of steel. Depression was not confined to the coal industry of this country, but affected the coal industries of other countries. With a general expansion of world trade there would be a larger consumption of fuel, and even allowing for the economies of new machinery, they would be able at some future date to employ in the industry many more workers than some people imagined. The coal situation was a world problem. In the first weeks of the coal dispute he had made every endeavour to emphasise the importance of rational organisation of the industry, particularly upon its selling side. In most coal-producing districts various colliery companies had amalgamated, and the movement towards such amalgamations must be developed. Progress had been made in the formation of coal-selling organisations, but it was clear that no cure could be applied until a well-thought-out national scheme had been adopted.

After drawing attention to the importance of selling coal on a better classification and to the need for standardisation in screening, Lord Melchett referred to the coal-cleaning method developed by Dr. R. Lessing, and now being operated by one of the companies with which he himself was associated. The process depended upon the relative densities of the wanted and unwanted portions of coal in a suitable medium. The process had now emerged from the experimental stage, and the coke made from coal cleaned in that way was of particularly high quality, and contained very small quantities of ash. The main factor in the re-establishment of the coal industry of this country on a sound economic basis was its internal re-organisation in technology, commercial directions, and labour relations, followed by Imperial and international re-organisation and agreement. Internal re-organisation also should take place promptly. They were frequently faced with the rival claims of gas and electricity, but there should be no such rivalry. The conversion of coal into oil would undoubtedly yield an economic solution in the next decade.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

According to a *Financial Times* dispatch from Vancouver, with the object of still further centralising the executive and direction of the British Columbia Power Corporation, which controls the British Columbia Electric Railway, the president, Mr. GEORGE KIDD has been appointed chairman of the board, and Mr. W. G. MURRIN, the general manager, assumes the presidency. Mr. Kidd will remain in Vancouver in order to keep in touch with the big power development plans at Bridge River. He joined the railway company in London 21 years ago. Mr. Murrin left the London United Tramways 15 years ago to join the B.C. Electric Railway.

The Sports and Social Club of the Swedish General Electric Co. held a social and dance recently at Walthamstow, with an attendance of about 150 persons. During the evening Mr. K. HEDIN was presented with a gold watch and Mrs. HEDIN with a gold wristlet watch to commemorate, says a local paper, "the happy association they had with the employés of Fuller Electrical & Manufacturing Co. and Swedish General Electric, Ltd." Mr. H. HOLMES, the hon. secretary of the club, said that until quite recently Mr. Hedin had been their managing director, and a number of them had known him for a period of 25 years.

A small but representative gathering met in the Artists' Room at Pagani's on Wednesday last week to say "au-revoir" to Mr. ERNEST SHARP, who is leaving next week for a business trip of some months' duration in Australia and New Zealand. During the course of a very cheery evening, numerous speakers emphasised the fact that while Mr. Sharp's interests are, of course, primarily those of Messrs. Venner Time Switches, Ltd., his regular visits abroad are of great value to the whole industry owing to the genial but none the less persistent manner in which he advocates the purchase of British goods. We wish Mr. Sharp a good voyage and every success.

The marriage took place at Nuneaton, on November 19th, of Mr. ARTHUR RAINBOW, a member of the staff of the Nuneaton Corporation Electricity Department, and Miss MAY FROULKES, of Barnstaple.

Mr. A. P. YOUNG, general manager of the Coventry works of the British Thomson-Houston Co., Ltd., has been appointed associate manager of the main works at Rugby, and he is succeeded at Coventry by Mr. W. Vincent, his former assistant.

Mr. L. PEARCE, of Norwich, has been appointed to fill the recently advertised vacancy for a switchboard attendant at Aylesbury.

Lord QUEENBOROUGH has been appointed chairman of Messrs. Siemens Bros. & Co., Ltd.

Mr. PHILIP CLARKE, of Wakefield, has been appointed manager and engineer of the electricity undertaking of the Urban Council at Newry, County Down, at £300 a year. There were 56 applicants.

Mr. A. S. HOPPELL, of East Grinstead, has been appointed assistant engineer at the Grays Urban Council electricity works.

Mr. W. S. CURRY, chief draughtsman in the South Shields Corporation Electricity Department, was presented by the staff with an oak bureau on leaving to take up an appointment with the Liverpool Corporation. The presentation was made by Mr. James Edgar, borough electrical engineer, supported by Councillor G. H. Linney, chairman of the Electricity Committee.

Taunton Corporation has increased the salary of Mr. A. J. HOWARD, the borough electrical engineer, by £50 per annum as from October 1st, 1928.

Herr KARL KUPFMULLER, chief engineer of the Siemens and Halske Co., Berlin, has been appointed Professor of Electrotechnics at the Technical High School of Dantzig in succession to the late Herr Roessler.

Obituary.—MR. W. HAMMOND.—The death is announced at the age of 59 years of Mr. WILLIAM HAMMOND, who had since 1914 been on the staff of the power house of the British Thomson-Houston Co., Ltd., at Rugby.

COUNCILLOR G. A. BROWN.—Councillor G. A. Brown, the late chairman of the Lytham Tramways Committee, was interred on November 22nd. Tramwaymen in uniform lined the pathway from the gates to the church entrance.

MR. G. H. HALE.—The death took place on November 18th, at Mobberley, Cheshire, of Mr. G. Herbert Hale, late of the General Electric Co., Ltd., Manchester.

MR. A. HIDER.—Mr. Arthur Hider, of Torquay, who left that town in August last to take up a post on the mechanical and engineering staff of the African Electrical Trust, Sierra Leone, has died at Accra of pneumonia, at the age of 24 years. He was in charge of the refrigerating and electrical plant at Accra.

HERR A. MULLER.—The death recently occurred in Berlin, at the age of 76 years, of Herr A. Muller, one of the leading German authorities on electric accumulators.

MR. R. M. FITCH.—We regret to learn that Mr. R. M. Fitch, who accompanied Sir Hugo Hirst, Bt., to Australia as his secretary, died at Sydney on Tuesday last.

Will.—Mr. A. LAMBERTON, a director of the Mirrlees, Watson Co., Ltd., left £155,979 personal estate.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

British Radio Gramophone Co., Ltd.—Public company. Registered November 20th. Capital, £125,000 in 75,000 8 per cent. cumulative preference shares of £1 each and 1,000,000 ordinary deferred shares of 1s. each. Objects: To enter into three agreements and to carry on the business of dealers in and manufacturers, importers and exporters of gramophones, phonographs or any other sound-producing or musical instruments, radio, television and electrical apparatus, and all accessories and fittings, &c. The subscribers (each with one preference share) are:—W. S. Worthington, "Little Pipers," Clay Hill, Enfield, managing director of the Peto Scott Co., Ltd.); S. E. Parish, 24, Emerson Road, Ilford, incorporated accountant; H. G. Eastcott, 37, The Orchard, Winchmore Hill, N.21, civil engineer; G. H. Gradon, 69 Tabley Road, Tufnell Park, N.7, salesman; C. N. Cooling, 37, Tennyson Avenue, New Malden, buyer; W. F. Hughes, 29, Harrow View Road, Ealing, W.5, sales manager; R. K. Budge, 17, Stone Barton, Plympton, Devon, radio engineer. Solicitors: Ashurst, Morris, Crisp & Co., 17, Throgmorton Avenue, E.C.

Ultra-Violet Ray Co., Ltd.—Private company. Registered November 22nd. Capital, £300 in £1 shares. Objects: To carry on the business of manufacturers of apparatus for the application of ultra-violet and other light and/or heat rays, opticians, electricians, &c. The permanent directors are:—L. Alexander, 42, Heywood Street, Cheetham Hill, Manchester (director Jack Davies, Ltd., and other companies); G. D. G. Leadbetter, Stravally, Westgate, Hale (director Radsons, Ltd.). Registered office: 29, Range Road, Whalley Range, Manchester.

F. O. Coward, Ltd.—Private company. Registered November 22nd. Capital, £1,500 in £1 shares. Objects: To acquire the business of an electrical engineer and battery service station proprietor now carried on by F. O. Coward, at 21, Lower Castle Street, Bristol, as "F. O. Coward." The first directors are: F. O. Coward, Beech View, Coombe Dingle, Bristol; S. D. H. Brown, 29, Rudthorpe Road, Horfield, Bristol. Solicitors: C. Arragon Stevens, 11, Denmark Street, Bristol.

C. H. Roberts & Co., Ltd.—Private company. Registered November 19th. Capital, £2,000 in £1 shares. Objects: To acquire the business of electrical engineers, salesmen and contractors carried on by C. H. Roberts and T. R. Jackson at 77, High Street, Broadstairs, Kent. The directors are:—C. H. Roberts, 10, St. George's Road, Broadstairs; T. R. Jackson, 2, Railway Cottages, Broadstairs. Secretary: G. A. Russell, West Cliff Road, Broadstairs. Registered office: 77, High Street, Broadstairs, Kent.

British Dynamic Reproducers, Ltd.—Private company. Registered November 17th. Capital, £500 in £1 shares. Objects: To acquire an option to purchase an invention relating to improvements in dynamic reproducers, to adopt an agreement with G. D. Le Lievre and L. W. Murkham, and to carry on the business of manufacturers, exporters and importers of and dealers in instruments, appliances and devices for recording, reproducing, transmitting, and amplifying speech, music, &c. The first directors are: G. D. Le Lievre (chairman), 8, Beverstone Road, Brixton, S.W.2, engineer; L. W. Murkham, 14, Eleanor Road, E.15, electrical engineer. Registered office: 22, Queen Street, E.C.

West Cambrian Power Co., Ltd.—Private company. Registered November 16th. Capital, £10,000 in 7,000 6 per cent. cumulative preference shares of £1 each and 60,000 ordinary shares of 1s. each. Objects: To adopt an agreement between J. R. Parkington of the first part, M. Porn and T. A. Dunwoody of the second part, and the company of the third part, and to carry on at Fishguard, Pembroke, and elsewhere in Wales the business of suppliers of electrical energy for all purposes. The first directors are:—M. Porn, 31, Lancaster Road, N.W., engineer and merchant; T. A. Dunwoody, 103, Foxley Lane, Purley, engineer and merchant; J. R. Parkington, Newcastle Emlyn, Carmarthen, engineer (all permanent). Secretary: A. P. Ford-Moore. Registered office: 72-78, Fleet Street, E.C.4.

Wireless Slot Machines, Ltd.—Private company. Registered November 23rd. Capital, £100 in £1 shares. Objects:—To carry on the business of manufacturers of wireless, telegraphic, telephonic and photographic machines, valves, instruments, and equipment, &c. The subscribers (each with one share) are:—W. J. Knight, "Kenwood," Field Close, Ruislip, company secretary; H. Sharrott, 127, Upper Brockley Road, Brockley, S.E.4, cashier. Registered office: 3, London Wall Buildings, E.C.2.

Official Returns of Electrical Companies.

Electrical Finance and Securities Co., Ltd.—Satisfaction to the extent of £2,000 on November 1st, 1928, of charges dated July 29th, 1927, and July 6th, 1928, securing £196,800.

Langs (Wimbledon), Ltd.—Mortgage debenture dated November 9th, 1928, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital and patents granted or to be granted to the company or to J. B. Bower. Holder: Major L. J. Mathias, Aberystwyth.

Bowyer-Lowe Co., Ltd.—Deposit on November 10th, 1928, of deeds of factory, Spring Road, Letchworth, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

James Keith & Blackman Co., Ltd.—Satisfaction in full on November 10th, 1928, of debentures dated November 19th, 1918, and March 25th, 1924, securing £2,650.

De Luxe Cars, Ltd. (formerly Portable Wireless, Ltd.).—Charge on leasehold premises in Northam, Devon, and Richmond, Surrey, dated October 26th, 1928, to secure £108. Holder: J. G. Angold, 18, Sackville Street, W.1.

City Notes.

Prospectuses.

Aeonic Radio, Ltd.—This company, whose registration was recorded in our last issue (p. 903), made an issue of 1,150,000 shares of 2s. each at par on Monday last. The prospectus showed that, in addition to the directors named in the registration, Sir William Kay and Sir Robert J. Lynn, M.P., are on the board, the former being chairman. The registered office of the company is at 845-850, Salisbury House, E.C.2. The company is to acquire the business of J. L. Gottlieb & Co., Ltd. (which includes the business formerly carried on by Cecil Hodges & Co., Ltd.), and that of the Aeonic Wireless Co., Ltd. Its principal object is the production of a five-valve "suitcase" portable receiver, and it will also continue the manufacture of a number of radio components and electrical equipment. The assets acquired are valued at £90,704, and the purchase consideration is stated to be £80,000 (£15,000 in cash and £65,000 in fully-paid shares). In addition, a sum not exceeding £25,000 may be paid for the stock-in-trade of J. L. Gottlieb & Co., Ltd. The company expects to have £75,000 available for working capital, and it is estimated that the first year's net profit will be £110,000.

British Radio Gramophone Co., Ltd.—On Tuesday last this company published a prospectus offering for subscription 50,000 8 per cent. cumulative participating preference shares of £1 each and 100,000 deferred shares of 1s. each at par. Brief details of the company's registration are given in the "New Companies" section of this issue. Supplementing these, the prospectus gives the directors' names as: Sir Ernest A. S. Bell, C.I.E., M.Inst.C.E. (chairman), Mr. W. S. Worthington (managing director of Peto-Scott Co., Ltd.), Mr. S. E. Parish (sales manager of that company), and Mr. W. H. S. Worthington. The registered office is at 77, City Road, E.C.1. The company has been formed to acquire the whole of the share capital of Peto-Scott Co., Ltd., manufacturers of electrical reproducing gramophones, radio-gramophones, and radio receivers. The New Times Sales Co., which deals with Peto-Scott apparatus on the hire-purchase system, is also taken over. The purchase consideration is £25,000 in 8 per cent. preference shares. From the proceeds of the present issue and from deferred shares already subscribed for or under option the company expects to derive a working capital of £99,000 for the development of the business to meet expanding demands.

Official Notice re Companies.

The names of the undermentioned companies will be struck off the register at the expiration of three months unless cause is shown to the contrary:—

Albert Electrical Co., Ltd.
Atelan Wireless Co., Ltd.
British Gramophone & Wireless Co., Ltd.
Compare Secret Radio Telegraph Co., Ltd.
Freshwater & District Electric Supply Co., Ltd.
Norton Electric, Ltd.
Princess Electrical Co., Ltd.
Radio Recorders, Ltd.
Reliance Electrical Supplies, Ltd.
Switchgear & Electrical Productions, Ltd.
Travelling Electric Night Signs, Ltd.
Trust Electrical Accessories Mfg. Co., Ltd.
Wavelengths, Ltd.
Westminster Battery Co., Ltd.
Wireless & General Engineers, Ltd.
Wireless Waves Co., Ltd.
Brotherton Ediswan Tubes & Conduits, Ltd.
Electropeds, Ltd.
Radieco, Ltd.
Wireless Equipment, Ltd.

Burma Electric Supply Co., Ltd.

The total receipts for the year ended July 31st last were £62,487. After meeting working expenses, &c., and adding interest and the balance brought forward (£7,240), there is an available balance of £31,235, as compared with £34,040 last year. Of this, £10,000 is transferred to reserve; the final ordinary dividend is 3 per cent., making 6 per cent. for the year (against 8 per cent.); and £6,825 is carried forward. The report says that bad trade and omnibus competition seriously affected tramway receipts. New regulations governing omnibuses are to come into force next year. The company has been granted a new tramway order and lighting licence.

Consolidated Gas, Electric Light and Power of Baltimore.

A dividend of $0.75 per common share has been declared in respect of the quarter ending December 31st.

Stock Exchange Notices.

Dealings in the following securities have been specially allowed by the Committee of the Stock Exchange under Rule 159:—

Jerusalem Electric and Public Service Corporation, Ltd.—10,000 cumulative preference shares of £P1 each, fully paid, Nos. 120,001 to 130,000. 170,000 new cumulative preference shares of £1 each, 5s. paid, Nos. 130,001 to 300,000. 30,000 ordinary shares of £P1 each fully paid, Nos. 1 to 30,000 (ranking for dividend from various dates). 90,000 new ordinary shares of £P1 each, 2s. paid, Nos. 30,001 to 120,000.

Midland Counties Electric Supply Co., Ltd.—85,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,585,001 to 1,670,000.

Underground Electric Railways Co. of London, Ltd.—208,951 ordinary shares of £1 each fully paid, Nos. 5,943,326 to 6,152,276.

Shropshire, Worcester and Staffordshire Electric Power.—205,000 new "B" ordinary shares of £1 each, fully paid, Nos. 800,001 to 810,000 and 1,460,001 to 1,655,000.

The undermentioned have been ordered to be officially quoted :—

Beaver Trust.—120,000 ordinary shares of £1 each, fully paid, Nos. 1 to 120,000; and 180,000 5½ per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 180,000.

Constantinople Telephone.—£132 6 per cent. certificates, Nos. 4,347 to 4,352 (£22) (bearer).

Underground Electric Railways.—208,951 ordinary shares of £1 each, fully paid, Nos. 5,943,326 to 6,152,276.

Buenos Ayres Lacroze Tramways.

Both receipts and working expenses declined during the year ended June 30th last. The balance on working was $2,773,875. After adding the balance brought in and providing for debenture interest, renewals, &c., it is proposed to place $61,148 to reserve, to allocate a similar amount to the board, to distribute $1,000,000 to the shareholders, to transfer $200,000 to extraordinary reserve, and to carry forward $35,863.

Southern Brazil Electric Co., Ltd.

The report for the year ended December 31st, 1927, shows a net profit of £9,055 (against £390). The application of this to the existing debit balance reduces the latter to £30,053. Advances to subsidiary companies increased by £61,583 during the year, and in August, 1927, an issue of £200,000 7 per cent. prior lien debentures was made.

Ceara Tramway, Light and Power Co., Ltd.

The net revenue, in sterling, for the year ended June 20th last was £27,572. To this is added £7,226 brought forward, making £34,798. The debenture interest is paid, £12,500 is placed to reserve, and a dividend of 5 per cent., free of tax, is recommended on the ordinary shares, leaving £7,733 to be carried forward.

Dorman, Long & Co., Ltd.

The profit for the past year rose from £273,338 to £353,208. After meeting debenture interest and the 6 per cent. preference dividend, £39,940 is applied to debenture redemption, and £50,000 to depreciation, and £4,622 is carried forward.

Radio Corporation of America.

The gross income of the Corporation and its subsidiaries during the quarter ended September 30th was $23,643,332 and the surplus profit $5,221,146, making the surplus profit for the first nine months of this year $9,745,924.

British Mannesman Tube Co., Ltd.

There was a net deficit of £90,978 upon the accounts for the year ended June 30th, against one of £108,944 for 1926-27. This increases the total adverse balance to £555,002.

Calcutta Tramways Co., Ltd.

An interim dividend of 4½d. per share, free of tax, has been declared on the ordinary shares. No interim dividend was paid last year, but the final distribution was 5 per cent.

J. & E. Hall, Ltd.

A final ordinary dividend of 6 per cent., making 8½ per cent. for the year (against 7½ per cent.) is being paid out of a profit of £57,056.

Western Telegraph Co., Ltd.

A dividend of 5s. per share, free of tax, has been declared in respect of the quarter ended September 30th.

Canadian General Electric Co.

A dividend of 1¾ per cent. has been declared on the preference stock for the quarter ending December 31st.

Lancashire Electric Light and Power Co.

A half-yearly dividend at the rate of 6 per cent. per annum, free of tax, has been declared on the first preference shares.

Pinchin, Johnson & Co., Ltd.

The directors propose to increase the company's capital from £1,350,000 to £2,000,000. Several additional businesses have been acquired.

Liverpool Electric Cable Co., Ltd.

We are informed that the company is increasing its capital from £75,000 to £200,000.

Pennsylvania Water & Power Co.

A dividend of $¾ per share has been declared on the common shares for the quarter ending December 31st.

Swiss Companies.

The *Banque Générale pour l'Industrie Electrique*, Geneva, has closed its first financial year (ended June 30th) with net profits of 1,111,000 fr., from which 391,000 fr. has been written off capital expenses and the balance placed partly to reserve and partly carried forward.

The *Electro Values Company*, Basle, which is closely associated with the Swiss Bank Verein, reports net profits of 2.38 million fr. for 1927-28, as compared with 2.29 millions in 1926-27. The dividend is maintained at 7 per cent., but this time it is paid on the whole of the capital of 30,000,000 fr.

Stocks and Shares.

MONDAY EVENING.

THE illness of the King has aroused grave personal concern in the City, where his Majesty is regarded with a loyalty that is mingled with respect and affection. Stock Exchange prices present, however, a firm front, in spite of the approach of the Christmas season, and the very considerable amount of selling that took place earlier in the month on account of people who had plunged, perhaps, a little out of their financial depth. Shares in good companies have been readily taken. As for the others, applicants for new issues of the sketchy order continue to fidget as to whether they ought to sell or not, and their nervousness is likely to exercise a depressing influence over what may be called the gambling counters, or, as the Stock Exchange irreverently calls it, the dirt track market, for some time to come. The sound stocks and shares are, however, in demand as active as ever. There seems to be no end to the amount of money that is available for investment in real securities.

Stock on Offer.

Occasionally a line of shares will come to market, but it becomes placed, as a rule, without much waste of time.

At the moment of writing, there happens to be a parcel of 5,000 Callender's 7½ per cent. second preference shares offered at 28s. At this price the return on the money is £5 7s. 4d. per cent., with dividends due in June and December. The yield is certainly modest enough, but considering the security at the back of the shares, it is a foregone conclusion that the latter will find a home without any difficulty.

Last week's issue of Prussian Electric 6½ per cent. bonds at 93½ was not much of a success from the spectacular point of view. The subscription-lists closed within an hour and a half of their having opened, but applicants apparently received what they asked for, and the price opened at 1 discount. This was subsequently improved upon, and the scrip recovered to its issue price. The security, judged by the prospectus, looked reasonable enough to ensure over-subscription.

Marconi Excitements.

The great excitement of the week has been another dramatic jump in the price of Marconi shares, accompanied by very excited dealings, and by a keen demand from the United States for the company's bearer shares. These latter rank in all respects, so far as dividend and assets are concerned, with the registered, but the company is permitted to issue only 25 per cent. of its share capital in warrants to bearer, and this proportion has been reached. Meanwhile, from New York came furious bidding for the bearer warrants, the price of which stood at one time at no less than 30s. above that for the registered shares, a disparity for which no intrinsic justification could be claimed, and which suggested that some people had been caught short of the bearer shares. Canadian Marconis, 41s. this time last week, are now 26s. 9d. higher—an amazing performance. Marconi Marines have gone up from 2¾ to 3¼. It may be recalled that plain hints were given here as to the likelihood of the dividend for the current year being more than 15 per cent. Marconi (parent) £1 shares at 5½ are 5s. higher on the week. The 10s. shares show a gain of no more than 9d., at 78s. 3d.

Imperial Telegraphs Bill.

Eastern cable stocks and shares have been taken in hand and run up in price in consequence of the second reading of the Imperial Telegraphs Bill. This went through Parliament more easily than it had been anticipated would be the case, and the final stages are not expected to produce sufficiently strong opposition to have any effect upon the ultimate result. In consequence, the prices of the various stock and shares have been moving towards the £300 for Eastern Telegraph stock and £30 for each of the three companies' shares—Eastern Extension, Westerns and Globes—which, according to market valuation, the new issues should be worth when they are divided in exchange for the existing interests. These valuations are, of course, arbitrary, and it remains to be seen whether the public will regard a Communication Company's 5½ per cent. preference as being worth 20s., and the 7½ per cent. ordinary and the "B" deferred as similarly valuable. Stock Exchange experience rather suggests that when the expected has happened, and there is nothing very much left to "go for," the tendency is for people to sell what they bought earlier in the expectation of results which, when announced, do no more than endorse previous anticipations. Anglo-American Telegraph deferred strengthened to 24½.

Mexico Trams.

The price of Mexico Tramways 5 per cent. general consolidated first mortgage gold bonds is 81, coupons being due on March 1st and September 1st, and the bonds carry arrears of interest amounting to 32 per cent. The company is steadily paying these back coupons, and the progress of the undertaking suggests that, in course of time, the whole of the arrears will be wiped off. Mexico Tramways holds a controlling interest in Mexican Light and Power, the securities belonging to the Mexico Tramways bringing in $1,100,000 per annum. To pay the interest on the Mexico Tramway fives takes $508,000—that is to say, the interest on the Mexico Tramway first mortgage bonds is covered twice over without taking into

account any revenue that might accrue from the tramway itself. The bonds make a good speculative investment, and when it is remembered that the common shares, which receive no dividend at all, stand at 53, on dividend prospects, it will be seen that the bonds merit consideration from people who are prepared to take them up and await a prospect of appreciation, in addition to receiving 6¼ per cent. on their money. For the widow and the orphan, the investment is thoroughly unsuitable. Mexico is not yet sufficiently settled to permit of Mexican utility companies' securities being listed as other than speculative in character.

"Amplified Electricity."

The statement that a discovery has been made whereby electricity can be "amplified" has caused a little nervousness amongst holders of shares in the electricity supply companies. Stock Exchange brokers have been receiving many inquiries from their clients with regard to the effect which such a discovery might be expected to exert upon the stocks and shares of these companies. Of course, no ground for apprehension exists; the worthless nature of the device in question was exposed in the leading columns of last week's issue. The managements of the companies are always on the alert for any new developments in an industry in which the latter have a peculiarly wide scope, and they may be depended upon to meet or to acquire anything of value in this direction.

Electricity Supply Changes.

Metropolitan Electric ordinary shares and Electric Supply ordinary are down 1/16, and County ordinary at 43s. are 6d. lower, these being the only changes in the list of London shares. Newcastle-on-Tyne ordinary are 1s. 3d. off, at 25s., on sales by holders who prefer to exchange into the new shares, taking up these at 23s. 6d. The premium on the new issue remains at about 9d., one new share being offered, it will be remembered, in respect of every complete five old shares, preference or ordinary, held at the end of last month. Northampton ordinary, quoted ex rights on November 19th, are 1/16 down at £2, but the new shares maintain their price at 9s. premium over the issue price of 20s. Bournemouth and Poole have hardened at 31s. 4d. Yorkshire Electrics fell back to 34s. The Shropshire, Worcestershire and Staffordshire Company is offering one new share in respect of every four old shares at 24s. The rights are worth 8s. Shropshire "A" ordinary are quoted at 35s., and the "B" at 33s. 3d., both ex rights.

New Issue Opportunities.

Reference has been made here on so many former occasions to the risks run by some people of losing their "rights," that apology seems due for mentioning the matter once more. Yet everyday experience places beyond doubt the fact that there is a surprising number of investors who throw away any new invitation to put up money when they have no capital to spare for this purpose. They don't stop to think that there may be other folks who are glad to buy, at a premium, shares offered at some "bonus" price, and to pay the proprietors of the rights a profit for such new shares. Many companies nowadays draw their shareholders' attention to the probability that new issues may have a market value over and above the price at which the shares are offered. The shareholder, before throwing away any new offer, should make sure of the market value of an allotment, in order to see whether a premium is obtainable. There are occasions, happily very rare, when so-called Rights might be more correctly described as Wrongs.

Underground Income Bonds.

Though no quotable changes worthy of particular mention have occurred in the stocks of London Tube railways, the 6 per cent. income bonds of the Underground Electric Railways continue to be the focus of lively attention. Holders of these income bonds have the right to convert into the company's ordinary shares, at 21s. per share. The present price of the shares is 27s. The income bonds are secured upon certain collateral which becomes freed from this charge when the bonds are converted into shares. From the company's point of view, the more collateral that it can command, the better for its own purposes; hence the idea that the directors will endeavour to render the conversion popular, as would be the case if the dividend on the shares were to make an attractive showing.

Miscellaneous Matters.

Canadian General Electric shares have risen 5 points to 117½, but the company's preferred at 60 have gone back a point. Burma Electrics are a little lower at 2?s. 9d. The list of "dollar" stocks is fairly steady, most of the interest at the present moment centreing on the shares of two or three companies, around which a wild gamble is taking place. In the industrial group, Telegraph Constructions have risen to 25, showing a gain of 10s. British Aluminiums are easier at 43s. 9d. A few ex dividend markings have had no effect upon prices, other than the nominal deduction of the dividend. Shares in the "heavy" industries are living up (or down) to their label, and the rubber share market has fallen into somnolence. A fair amount of activity continues in Ever-Ready shares, now at 26s., and Everlite at 6s. 3d. attract speculative interest. Baird Televisions are being dealt in around 6s. 3d., and Burndept Wireless are quoted at 7s. for the 5s. shares.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Dividend. 1926.	1927.	Price Nov. 25, 1928.	Rise or fall.	Yield. p.c.
	£					
Bournemouth and Poole	1	14†	15	3½	+1/16	... ...
Brompton Ordinary	1	8⅜	8½	27/-	—	5 3 8
Charing Cross Ordinary	1	8½	8½	27/-	—	5 3 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8⅝	8⅝	27/6	—	5 1 10
City of London	1	10	10	30 9	—	4 16 0
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	39/-	—	4 2 0
County of London	1	7½	7½	43'-	—6d.	3 9 9
do. do. 6% Pref.	1	6	6	23/6	—	5 2 2
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	53 3	—1/8	4 2 8
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	30/-	—6d.	5 0 0
London Electric	1	8½	8½	26/6	—	5 5 8
Metropolitan	1	8	9	2½	—1/8	4 4 2
do 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	30/6	—	4 5 8
Mid. Elec. Power	1	—	15	99/6	—	... ...
Newcastle-on-Tyne Ordinary ...	1	5	6	25 3	—1/8	4 16 0
do. 7% Pref. ...	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10⅝	—	5 11 1
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	32/6	—	4 18 6
South London	1	8½	8½	27/6	—	5 2 8
Urban Ordinary	1	7	7	38/3	—	... ...
Westminster Ordinary	1	8½	8½	27/-	—	5 8 8
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	23/6	—	6 7 8
Yorkshire Elec.	1	8	8	34'-	—1/6	4 14 2

†4% of which was tax free.

Home Rails.

Central London Ord. Assented ...	Stock	4	4	73	—	5 9 7
Metropolitan	,,	8	8	66	—	4 11 0
do. District	,,	8½	4	80	+½	5 0 0
Underground Electric	£1	1½	5	27/-	—	3 14 1
do. do. Income ...	Bonds	6	6	129	—	4 13 0

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	102½	—	5 17 1
do. Def.	,,	1½	1½	24½	+¾	6 2 5
Automatic Telephone		1	10	10	2½	—1/8	4 14 1
Eastern Extension		10	10	10	26½	+½	*3 16 4
Eastern Tel. Ord.	Stock	10	10	10	262½	+7	*3 16 4
Globe Tel. and T. Ord.		10	10	10	26½	+½	*3 16 4
do. do. Pref.		10	6	6	11½	—	5 8 1
Great Northern Tel.		10	20	20	29	—	... ...
Indo-European		25	10	10	47½	—	*5 5 8
Marconi		10/-	5	*10	7:/3	+9d.	... ...
Marconi-Marine		1	8½	12½	3½	+⅛	3 17 0
Oriental Telephone Ord.		1	12	12	3 1/8	—	*3 18 0
United R. Plate Tel.		5	8	8	9⅜	+½	*4 5 8
Western Telegraph		10	10	10	26½	+½	3 16 4

*Interim.

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8⅜	—	7 11 9
do. do. 2nd. Pref. ...	5	6	6	8½	—	8 11 6
do. do. 5% Deb. ...	Stock	5	5	78xd.	+½	6 8 2
British Electric Traction Def. Ord.	,,	—	—	570	+10	... ...
do. do. Pref. Ord.	,,	8	7½	124xd.	—4	5 19 0
Brazil Traction	100	6	7	74½	—2	9 7 0
Brit. Colombia Elec. Ry. Pos. ...	Stock	5	5	90½	—	5 2 7
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	12/-	+6d.	... ...
London United Tram Deb. ...	Stock	4	4	62	—	6 9 1
Mexico Trams. 5% Bonds	—	5	5	61	+1	6 3 5
Mexican Light Common	100	Nil	Nil	82½	—3	... ...
do. 7% Pref.	100	Nil	7	80	—	8 15 0
do. 1st Bonds	—	5	5	77	—	6 10 9
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...

Manufacturing Companies.

Babcock & Wilcox	1	13	15	67/-	—	*4 9 9
British Aluminium Ord.	1	10	10	43/9	—9d.	*4 11 4
British Elec. Transformer Pref....	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4⅜	—	3 12 9
Brush Ord.	1	10	10	23/9	—	8 19 2
Callenders	1	15	15	4⅜	—	3 12 9
do 6½% Pref.		6½	6½	1⅜	—	5 4 0
Crompton Parkinson Ord.... ...	£/-	—	—	20/6	—	... ...
do. 8% Pref.	1	—	8	25/-	—	6 8 0
Edison-Swan	4/-	10	10	12/6	—	3 4 0
do. 5% Deb.	Stock	5	5	89½	—	5 11 9
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Ord.	1	20	20	4⅜	—	4 6 7
English Electric	1	Nil	Nil	7/6	—	... ...
do. do. Pref	1	8	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	25/-	—	5 4 0
do. Ord.	1	7½	10	42/-	—	4 16 8
Henley	1	25	25	51xd.	—	4 8 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	18/6	—	... ...
Johnson & Phillips	1	12½	10	38 9xd.	—6d.	5 8 3
Met.-Vickers Ord.	1	8	6	38/9 xr	—⅛	... ...
do. Pref.	2	8	8	2?	—	5 19 5
Siemens Ord.	1	7½	7½	27/6xd.	—	5 9 9
Telegraph Construction	12	10	10	25	+½	*4 16 0

*Dividends paid free of Income Tax.

The Electrical Trade of Austria.

Figures for 1926 and 1927 Compared.

THE following tables give particulars of Austria's imports and exports of electrical machinery and apparatus in 1927, the total values in schilling (34½ schilling=£1), together with the total weights in quintals and the weights by countries of origin or destination, except in the case of lamps where the figures are in thousands instead of weights. Comparative figures for 1926 are given where available for purposes of comparison and notes are added of increases or decreases :—

Imports.

	1926.	1927.	Inc. or dec.
Dynamos and motors—			
Value in 1,000 schilling ...	4.299	5,056	+ 757
Number	17,605	31,300	+13,695
Weight in quintals	4,611	6,147	+ 1,536
From Germany	2,938	4,187	+ 1,249
„ Italy	33	48	+ 15
„ Switzerland	571	496	− 75
„ Czecho-Slovakia ...	204	312	+ 108
„ Hungary	714	892	+ 178
„ Great Britain ...	71	78	+ 7
Parts of ditto—			
Value in 1,000 schilling ...	948	565	− 383
Weight in quintals	2,122	1,991	− 131
Dynamos and motors connected with mechanical plant—			
Value in 1,000 schilling ...	2,003	2,927	+ 924
Number	12,367	20,271	+ 7,904
Weight in quintals	1,262	1,721	+ 459
From Germany	970	1,594	+ 624
„ Czecho Slovakia ...	34	8	− 26
„ Switzerland	37	10	− 27
„ Sweden	168	66	− 102
Stationary transformers—			
Value in 1,000 schilling ...	1,661	966	− 695
Number	3,109	3,864	+ 755
Weight in quintals	2,491	1,539	− 952
From Germany	1,043	912	− 131
„ Switzerland	1,339	528	− 811
„ Hungary	73	39	− 34
Rotary transformers—			
Value in 1,000 schilling ...	161	33	− 128
Number	175	152	− 23
Weight in quintals	223	35	− 188
From Switzerland	19	2	− 17
„ Hungary	176	1	− 175
Telegraph apparatus—			
Value in 1,000 schilling ...	63	91	+ 28
Weight in quintals	13	27	+ 14
*Telephone apparatus—**			
Value in 1,000 schilling ...	2,636	2,824	+ 188
Weight in quintals	498	673	+ 175
Radio apparatus—			
Value in 1,000 schilling ...	1,333	2,101	+ 768
Weight in quintals	196	326	+ 130
From Germany	92	151	+ 59
„ Great Britain ...	30	37	+ 7
*Röntgen and electro-medical apparatus—**			
Value in 1,000 schilling ...	806	958	+ 152
Weight in quintals	333	481	+ 148
Electricity meters and measuring apparatus—			
Value in 1,000 schilling ...	2,295	2,132	− 163
Weight in quintals	911	909	− 2
From Germany	763	701	− 62
„ Switzerland	111	159	+ 48
„ Czecho-Slovakia ...	2	7	+ 5
„ Hungary	26	23	− 3
Incandescent lamps—			
Value in 1,000 schilling ...	3,225	3,016	− 209
Thousands	3 038	2,497	− 541
From Germany	2,059	1,676	− 383
„ Hungary	948	250	− 698
Heating and cooking apparatus and electric irons—			
Value in 1,000 schilling ...	216	332	+ 116
Weight in quintals	142	330	+ 188
From Germany	124	236	+ 112
Other electrical apparatus—			
Value in 1,000 schilling ...	9,054	10,501	+ 1,447
Weight in quintals	6.296	8,961	+ 2.665
From Germany	5,406	7,332	+ 1,926
„ Italy	11	12	+ 1
„ Switzerland	274	790	+ 516
„ Czecho-Slovakia ...	156	272	+ 116
„ Hungary	310	337	+ 27
*Insulating tubes—**			
Value in 1,000 schilling ...	198	249	+ 51
Weight in quintals	1,116	1,578	+ 462
Lead-covered cable—			
Value in 1,000 schilling ...	12	22	+ 10
Weight in quintals	49	71	+ 22
From Sweden	8	23	+ 15
„ Germany	33	42	+ 9
Other cables and insulated wire—			
Value in 1,000 schilling ...	280	599	+ 319
Weight in quintals	265	623	+ 358
From Germany	109	199	+ 90
„ Italy	30	5	− 25
„ Switzerland	46	134	+ 88
„ Czecho-Slovakia ...	6	232	+ 226
Accumulators and plates—			
Value in 1,000 schilling ...	163	195	+ 32
Weight in quintals	270	368	+ 98
From Germany	163	272	+ 109
„ Sweden	79	37	− 42

Exports.

	1926.	1927.	Inc. or dec.
Dynamos and motors—			
Value in 1,000 schilling ...	7,139	7,631	+ 492
Number	12,656	16,976	+ 4,320
Weight in quintals	17,162	18,762	+ 1,600
To Bulgaria	1,025	506	− 519
„ Germany	2,212	1,713	− 499
„ Italy	736	1,045	+ 309
„ Poland	1,035	1,235	+ 200
„ Rumania	2,198	2,641	+ 443
„ Jugo-Slavia	2,565	2,400	− 165
„ Czecho-Slovakia ...	3,691	2,293	− 1,398
„ Hungary	714	1,850	+ 1,136
Parts of ditto—			
Value in 1,000 schilling ...	916	681	− 235
Weight in quintals	1,664	1,647	− 17
Dynamos and motors connected with mechanical plant—			
Value in 1,000 schilling ...	497	732	+ 235
Weight in quintals	370	376	+ 6
Number	3,625	5,777	+ 2,152
To Great Britain	124	108	− 16
„ Jugo-Slavia	11	15	+ 4
„ Czecho-Slovakia ...	116	103	− 13
„ Russia	78	2	− 76
„ Poland	4	27	+ 23
Stationary transformers—			
Value in 1,000 schilling ...	1,482	1,677	+ 195
Number	13,105	13,301	+ 196
Weight in quintals	3,524	4,255	+ 731
To Germany	205	646	+ 441
„ Italy	111	345	+ 234
„ Poland	151	260	+ 109
„ Rumania	742	664	− 78
„ Jugo-Slavia	1,399	744	− 655
„ Czecho-Slovakia ...	472	293	− 179
„ Russia	—	302	—
Telegraph apparatus—			
Value in 1,000 schilling ...	78	94	+ 16
Weight in quintals	55	28	− 27
To Poland	5	17	+ 12
„ Rumania	11	8	− 3
„ Jugo-Slavia	5	2	− 3
Telephone apparatus—			
Value in 1,000 schilling ...	5,315	6,202	+ 887
Weight in quintals	1,569	1,429	− 140
To Germany	257	56	− 201
„ Great Britain	9	7	− 2
„ Italy	97	306	+ 209
„ Czecho-Slovakia	553	659	+ 106
„ Netherlands	187	3	− 184
„ China	112	3	− 109
„ Turkey	76	99	+ 23

* Mainly from Germany.

	1926.	1927.	Inc. or dec.
Radio apparatus—			
Value in 1,000 schilling ...	5,321	6,179	+ 858
Weight in quintals	1,075	1,161	+ 86
To Belgium	43	18	– 25
„ Germany	223	171	– 52
„ Great Britain	112	211	+ 99
„ Italy	45	63	+ 18
„ Czecho-Slovakia	183	120	– 63
„ Poland	68	141	+ 73
Electricity meters and measuring apparatus—			
Value in 1,000 schilling ...	1,944	1,570	– 374
Weight in quintals	1,291	880	– 411
To Germany	28	23	– 5
„ Italy	7	10	+ 3
„ Portugal	131	21	– 110
„ Jugo-Slavia	117	30	– 87
„ Czecho-Slovakia	36	37	+ 1
„ Hungary	66	59	– 7
„ Great Britain	140	143	+ 3
Incandescent lamps—			
Value in 1,000 schilling ...	19,901	21,039	+ 1,138
Thousands	20,390	18,660	– 1,730
To German Ports	4,930	2,567	– 2,363
„ Germany	2,303	2,471	+ 168
„ Great Britain	1,898	2,324	+ 426
„ Italy	2,079	1,556	– 523
„ Czecho-Slovakia	557	9 25	+ 368
„ India	260	438	+ 178
„ Egypt	246	262	+ 16
„ United States	2,955	2,916	– 39
„ Mexico	73	—	– 73
Heating and cooking apparatus and electric irons—			
Value in 1,000 schilling ...	322	502	+ 180
Weight in quintals	414	648	+ 234
To Germany	15	44	+ 29
„ Italy	75	32	– 43
„ Jugo-Slavia	83	102	+ 19
„ Hungary	35	67	+ 32
„ Rumania	53	66	+ 13
„ Russia	9	100	+ 91
Insulating tubes—			
Value in 1,000 schilling ...	341	314	– 27
Weight in quintals	2,273	2,126	– 147
Other electrical apparatus—			
Value in 1,000 schilling ...	5,822	6,904	+ 1,082
Weight in quintals	8,827	10,340	+ 1,513
To Germany	506	865	+ 359
„ Italy	312	194	– 118
„ Poland	810	678	– 132
„ Rumania	1,101	999	– 102
„ Switzerland	42	168	+ 126
„ Jugo Slavia	1,941	1,469	– 472
„ Czecho-Slovakia	1,631	1,057	– 574
„ Hungary	741	921	+ 180
„ Great Britain	515	1,610	+ 1,095
Röntgen and electro-medical apparatus—			
Value in 1,000 schilling ...	1,485	1,452	– 33
Weight in quintals	663	887	+ 224
To Germany	132	249	+ 117
„ Rumania	121	158	+ 37
„ Jugo-Slavia	117	96	– 21
„ Czecho-Slovakia	108	80	– 28
Lead-covered cable—			
Value in 1,000 schilling ...	2,020	2,991	+ 971
Weight in quintals	9,868	14,941	+ 5,073
To Belgium	—	207	+ 207
„ Bulgaria	278	255	– 23
„ Poland	664	3,584	+ 2,920
„ Rumania	1,759	1,442	– 317
„ Jugo-Slavia	5,391	4,049	– 1,342
Other cables and insulated wires—			
Value in 1,000 schilling ...	2,990	2,477	– 513
Weight in quintals	6,347	4,958	– 1,389
To Great Britain	420	347	– 73
„ Poland	711	740	+ 29
„ Rumania	756	694	– 62
„ Jugo-Slavia	950	387	– 563
„ Czecho-Slovakia	396	334	– 62
„ Mexico	285	399	+ 114
Accumulators and plates—			
Value in 1,000 schilling ...	556	650	+ 94
Weight in quintals	1,648	1,707	+ 59
To Jugo-Slavia	1,418	831	– 587

The Imperial Telegraphs Bill.

Second Reading in the House of Commons.

THE Imperial Telegraphs Bill was read a second time in the House of Commons on November 21st. The Bill is a comparatively short one. The preamble refers to the origin of the Pacific, West Indian and Transatlantic cable undertakings; and to the report of the Imperial Wireless and Cable Conference which recommended the formation of a Communications Company and the sale to it of these undertakings. Clause 1 deals with the sale of the Pacific cable undertaking and stipulates the method of dealing with the proceeds; Clause 2 deals similarly with the West Indian undertaking; Clause 3 provides for the repeal of the Acts under which the two undertakings operate; and Clause 4 authorises the Postmaster-General to sell the Imperial Transatlantic cable undertakings to the Communications Company. The date of sale specified in each case is April 1st, 1928.

In moving the second reading, Mr. A. M. Samuel, Financial Secretary to the Treasury, said that the Bill did not deal with the "beam" service. The Imperial Conference recommended the sale of the cables outright; but the Government was leasing the "beam" for 25 years at a basic rent of £250,000 a year, representing a present value of about £4,000,000. If the profits of the Communications Company grew, the Government received, after the first three years, 12 per cent. of the excess of profits over a fixed standard of £1,865,000, while the balance of the surplus profits was divided; half went to the company, and the other half to the public in the form of reduced message rates or improved services. The three cable systems were very seriously affected by wireless competition. The Pacific cable was jointly owned by this country, Canada, Australia, and New Zealand. Its financial history had been chequered. It opened business in 1901, and for 14 years there were constant deficits, which were defrayed by the partner Governments. From 1915 to 1927, profits were earned and largely devoted to duplicating the cable. These profits were made in times of exceptional traffic during the war and the immediately succeeding period, and gave no indication of the present position and prospects of the system. In 1927-28, a beam wireless service between the British Isles and Australia entered into competition and the traffic receipts that year fell by £80,000. The cable was now just capable of earning interest on its loan capital, but if wireless competition continued, it might well return to its previous experience of annual deficits. The loan capital outstanding was £1,233,000. The cable was to be sold on the basis that the Communications Company took over this debt and paid, in addition, a capital sum of £517,000, divisible between the partner Governments. The recommendation to sell at this price had been accepted by all the partner Governments. The Dominion Governments were interested in this transaction to the extent of 13-18ths to our 5-18ths. The West Indian cable was owned by Great Britain, Canada, and certain West Indian Islands. The partner Governments had had to meet losses every year since the cable started, and the loss was a growing one. It had a debt in respect of the original capital of £379,000, and was very far from being revenue-earning. This cable was to be sold for £300,000. The remaining property was the Imperial Cables, consisting of two cables across the Atlantic operated by the Post Office, one of them an ex-German cable. These cables had usually earned a small profit of about £6,000 a year, but in the last completed year they earned only £1,300. They would be sold for £450,000. Taking the three properties together, the partner Governments were relieved of a debt of £1,233,000 on the Pacific cable. They also received in cash £1,267,000, apart altogether from payment of rent and £60,000 cash for the beam. The cables might be, and ought to be, a better earning asset when put into a large cable-wireless combination. The Government was satisfied that it was receiving fair and adequate terms. In this Bill the trend of modern industrial and scientific development was being followed. The object was to avoid overlapping and secure economies for the benefit of the consumer. Among the safeguards was the Advisory Committee, intended to represent the interests of all the different parts of the Empire.

Mr. Ramsay MacDonald moved the rejection of the Bill on the ground that it sacrificed public utility to private gain by disposing of valuable State undertakings to private interests. He declared that the function of the Imperial Wireless and Cable Conference had been that of a go-between joining the British Government and private interests. At every stage the way was paved for private enterprise to get a grip on the beam service owned by the Government.

After a long debate, in which certain members alleged that there had been a "financial ramp," Sir John Gilmour, who was the chairman of the Conference, replying for the Government, said that the problem of communications was not one which they could deal with solely by themselves. There were two ends to every kind of communication, and it became apparent at an early stage to those who were interested in the problem that Canada and Australia did not look upon the problem in the light in which the Opposition looked upon it.

It was true that the beam services had cheapened communication, but they had made the position of some of the cables increasingly difficult. They went into the Conference without any preconceived notions, and came to the conclusion that a merger company, formed between the great cable interests and the wireless interests, would be the proper solution of this problem. Their financial advisers, having had the fullest access to all the information, both of the Government concerns and of the wireless and cable companies, advised the Conference that the capital of the Communications Company ought not to exceed £30,000,000. On the board of the company there were to be two directors nominated by the company, but approved by the Government, and one of those directors was to be the chairman. At first the board would be large; but it had been arranged that the number of directors was to be reduced to 12. In addition there was to be an Advisory Committee representative of all the Governments concerned, and it would have a complete veto upon any proposed increase of rates of which it did not approve. Moreover, it was provided that there was to be British control of the company, and that the Government could assume control of the system at a time of war or national crisis. The telephone services were being reserved. He thought it could not be said that the Government had sold too cheaply or had failed to safeguard the interests of the community as a whole. He looked forward to the development of this scheme with confidence.

The second reading was carried by 258 votes to 134—majority, 124.

The Cardiff Engineering Exhibition.

Electrical Equipment for Mines Displayed.

ON Wednesday last week the President of the South Wales Institute of Engineers (Mr. W. O'Connor, F.G.S.), opened the annual exhibition at Cardiff of engineering appliances and equipment for use in and about mines, arranged by the Institute.

It is an indication of the state of affairs in South Wales that the display this year is not so good as the last one. This is especially the case on the electrical side (which has been the most important feature). A number of leading electrical concerns who participated in 1927 are absentees this year. It is noteworthy that the current exhibition contains no coal-cutting machinery.

The British Electrical Development Association is using the Exhibition as a means of drawing local attention to the Factory and Workshop Lighting Campaign. An exhibit of good and bad machine shop lighting has been prepared and Mr. J. L. H. Cooper, of E.L.M.A., lectured on the Campaign on Saturday last. At the time of our visit, however (November 22nd) the arrangement of the stand had not been completed.

The most prominent feature of the stand of Messrs. FERRANTI, LTD., is a mining type transformer, which we illustrate in fig. 1. This is equipped with removable radiators and h.p. and l.p. cable boxes. Its capacity is 150 kVA, and it is designed to reduce the pressure of three-phase current from 3,300 to 440 V. A typical pole type transformer is another exhibit. In this apparatus, as the result of research, greater use has been made of the properties of the materials employed to increase efficiency while reducing weight. These

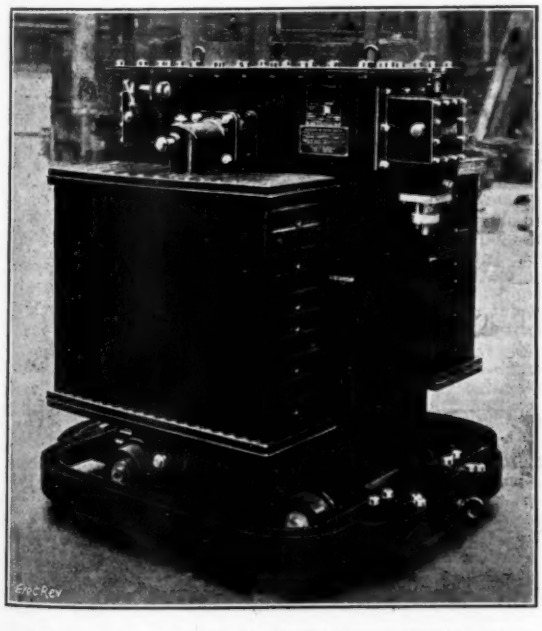


Fig. 1.—A "Ferranti" Mining-type Transformer.

transformers are made in a number of sizes up to 50 kVA for primary pressures up to 33,000 V. Examples of "Ferranti" house service meters (d.c. and a.c.) also appear on the standard, as well as several other instruments of the company's manufacture. Among the more recent departures of the company are the production of radio components and electric fires, and these are also represented. A special feature is made of the "Ferranti" h.t. supply unit.

On the stand of CEAG, LTD., there is a large selection of miners' lamps and ancillary apparatus. To demonstrate the latest type of cap lamp the company has arranged a model coal seam in total darkness, by which means the effects of various lamps are clearly seen. An inspection lamp shown

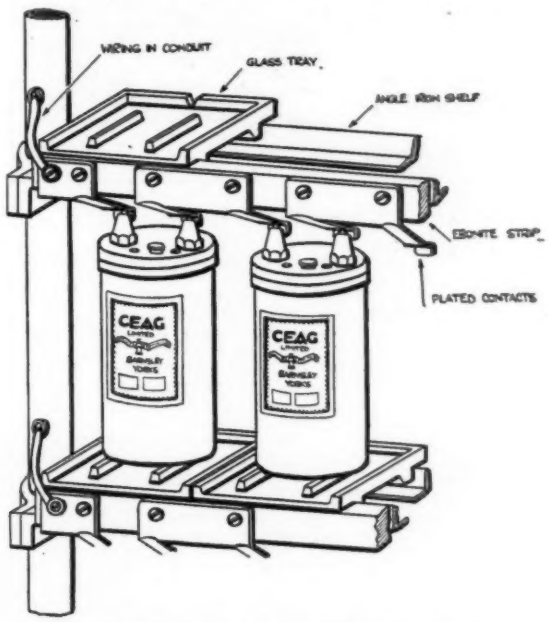


Fig. 2.—The "Ceag" Lamp-charging System.

is fitted with a silver-plated parabolic reflector with a focusing bulb which can be set to give a searching beam or to illuminate a wide area. The cell is simply slipped into the case and the lid screwed on, connection and switching being made by rotating the lid. Examples of the company's gas detecting device are shown. This comprises a small oil-flame lamp mounted above the electric lamp and lit electrically from the battery; it is protected by gauze, and has received the approval of the Mines Department. The "Ceag" charging system is a very simple arrangement. The cells are slipped on to glass trays under contacts, and a large number of cells can be put on charge very quickly, which is a consideration where thousands of lamps have to be dealt with during a shift. The line drawing reproduced in fig. 2 illustrates the system.

Several types of instruments and apparatus in connection with its intercommunication service are displayed by the NEW SYSTEM PRIVATE TELEPHONES (SOUTH WALES), LTD. Another section of the exhibit is devoted to the "Princeps" electric clock and its applications. This time keeping system employs a master clock with a special "free" pendulum, which does no mechanical work, and any number of "slave" dials. The company lets these clocks out on a rental basis.

Messrs. BABCOCK & WILCOX, LTD., are showing their interesting film illustrating the construction and operation of the "B. & W." boiler. The exhibits comprise three small-scale models of their principal types of water-tube boilers, *viz.*, the standard land type for power production and industrial

purposes—up to 36,000 lb. per hour evaporative capacity; the "C.T.M." type for very large power stations, &c.—up to 250,000 lb. per hour; and the marine type. The company also exhibits models and examples of steam valves and other accessories, as well as photographs of boiler installations.

Several patterns of scaling machines for boilers, tanks, &c., are displayed by ELECTRIC SCALING HAMMERS, LTD. These consist essentially of an electric motor and a flexible shaft, to the end of which is attached a rotating scaling head, which can be of various patterns for different classes of work. The motor casing is usually made of aluminium to reduce the weight of the appliance, and a suitable form of handle is fitted; in each case the switch is operated by the user's thumb. The attachments available include cutting heads, wire brushes, and a chain pattern for angles. The machines can, of course, also be used as portable drills or grinders.

Messrs. HASLAM & STRETTON, LTD. (Cardiff), again represent a number of concerns. From the electrical point of view the most interesting section of their display is that devoted to Reyrolle products. Here is shown a "distributing centre" built up from units. The example (fig. 3) consists of three 60-A units, but any convenient number can be used in combination. A standard plug is fitted on each unit for trailing cables and the cable box is detachable, obviating re-jointing when the gear is moved to a new position. There are interlocks between the circuit-breaker and the plug in each unit. The apparatus is rendered portable by mounting it on skids; the enclosure is of the earthed metal flameproof type. A single

Fig. 3.—A Reyrolle Distributing Combination.

100-A unit suitable for combination as described is also shown. Other Reyrolle exhibits are a 400-A, 660-V switch-fuse, comprising an oil-immersed circuit-breaker combined with fusible cut-outs; heavy duty plugs and sockets, &c.

Messrs. Haslam & Stretton also show a variety of "Thor" lamps for miners' and officials' use together with a charging stand, a magnet lamp opener, shaft and roadway lamps, &c. Another exhibit which appears on the stand is a Reavell compressor driven by a 35-h.p. Greenwood & Batley motor mounted on a slide-rail trolley, designed for colliery use.

Miners' lamps are also shown by Messrs. OLDHAM & SON, LTD., among the patterns on view being an improved 6-V lamp specially adaptable for coal-face lighting and a lamp fitted with a gas-testing device. Batteries designed particularly for mining use and auxiliary equipment are also shown.

The exhibit of Messrs. GENT & CO., LTD., displays great variety. The mining and industrial apparatus on view includes many kinds of improved mining bells, telephones, relays, tapper keys and pushes, all of incombustible materials, and flameproof. There are also to be seen indicators and alarms for registering and recording step by step the rise and fall of the liquid level in tanks, reservoirs, &c. Motor sirens for a.c. and d.c. are shown in sizes ranging from 0.1 to 4 h.p. A notable exhibit is the master transmitter which controls a number of "Pul-syn-etic" clocks on the stand and in the hall. The controlled clocks take many forms—bakelite, cast-iron watertight, and wooden cases, and some with "start and cease" sound signals. A waiting-train turret clock shown is capable of driving four 5-ft. dials; larger movements of the same type drive the dials of important public buildings in Liverpool and Glasgow. Other exhibits are intercommunication telephones, staff locators, bells and indicators, and radio apparatus.

The display of EDISON SWAN CABLES, LTD., comprises examples of the company's wires and cables. Two large boards are mounted on the stand, one of which bears samples of the many varied types of rubber-insulated cables which the company makes, while the other illustrates the construction from the copper rod to the completion of a .25 three-core 660-V solid bitumen cable. The exhibit also includes standard taped and braided cables, c.t.s. cables, lead-covered and "Virite" compound insulated cables. For mining work the company shows c.t.s. trailing cables, with and without cradle centres, and shot-firing cables. Samples of copper for overhead lines form another section.

A working exhibit of a "Bennis" chain-grate stoker of the "cellular" compartmental type is shown by Messrs. EDWARD BENNIS & CO., LTD. This is a special adaptation of the chain-grate principle to deal with all classes of fuel, including those of low grade and low volatile content. The maximum proportion of air space to secure rapid combustion is obtained by the use of a special type of dowelled link. Another working exhibit is a sprinkler-type stoker and self-cleaning compressed-air furnace designed for dealing with a wide variety of fuels. To accomplish this, provision is made for an independent range of adjustments for the speed of the grate and the rate at which the fuel is fed to it. The company also has working models of a "U"-link chain conveyor and a coal elevator and tray conveyor.

Standard and special apparatus is displayed by the LEA RECORDER CO., LTD. This includes a standard "V"-notch recorder for the measurement of boiler feed water, condensate, mine pump discharge, &c.; also the new "Excelsior" type recorder for the measurement of large quantities of water for mining and civil engineering purposes; and a special design of recorder for use with a compound "V" notch or stepped weirs for measuring streams and rivers. To demonstrate the company's coal meter, one is shown fitted to a working model of a Babcock & Wilcox chain grate stoker. There are also a special coal-flow indicator for chain-grate stokers and a coal meter for use with mechanically-fired Lancashire boilers. A Lea "Cubi-Meter" is shown measuring the discharge from a working elevator; this machine is specially applicable to the measuring of supplies of coal to pulverisers. The company also shows an automatic sampler for liquids, as well as numerous photographs, &c.; of installations employing its apparatus.

Fig. 4 illustrates one of the exhibits of the YORKSHIRE ELECTRIC TRANSFORMER CO., LTD., a three-phase 500-kVA indoor type transformer removed from its tank to show the construction. By this means the company demonstrates the excellence of its design and workmanship. The company shows the tank separately and also one of its pole-type transformers, mounted.

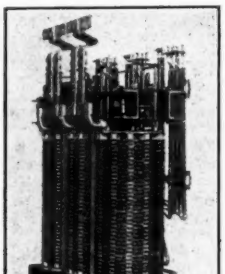


Fig. 4.—A Yorkshire Electric Transformer Exhibit.

The SOUTH WALES ELECTRICAL POWER DISTRIBUTION CO. has an "electrical development" display, by means of which it demonstrates its ability to supply power for industry over a wide area. There are a relief map showing the extensive transmission system and photographs illustrating the type of work carried out by the company. In addition, the company exhibits models of the new "Grid" towers and sub-stations in course of erection for the Central Electricity Board.

Messrs. W. B. DICK & CO., LTD., display many samples of their "Ilo" lubricating oils. Special types are shown for use in high-speed reciprocating engines, compressors, turbines, transformers, switchgear, and other plant in collieries and allied undertakings.

On the stand of BRITISH ELECTRICAL REPAIRS, LTD., are displayed examples of repairs carried out by the company on armature coils and other electrical parts. There is also a model of the vacuum drying and pressure impregnating plant which the company employs, together with treated samples.

The "Elverson Oscilloscope" is exhibited by the NEW OSCILLOSCOPE CO., LTD. This has previously been described in our columns. The device is employed for inspecting moving machinery; by means of a synchronised flashing lamp the machinery under examination is made to appear stationary. It will be seen that this enables any defects in running, including undesirable variations of speed, to be detected in a simple manner. Two forms of the instrument are available. Type "A" not only gives a stationary view, but also enables the observation to be carried out at a thousandth part of the machine's speed. Type "B" affords a stationary view only. Both patterns can be rotated to enable any particular part of the machine to be inspected, and they are so arranged that one, two, or four flashes of the lamp can be obtained per revolution. The company also shows a simple process for the electrolytic prevention or removal of boiler scale.

Messrs. ALFRED HERBERT, LTD., exhibit a typical "Atritor" machine for drying, pulverising, and firing coal. The machine, which has an output of 500 lb. per hour, is shown in parts.

SWITCHGEAR & COWANS, LTD., exhibit cubicle type gear for 300 A at 11,000 V, with a rupturing capacity of 250,000 kVA.

In connection with the exhibition the *Western Mail and South Wales News* published a special engineering supplement last week. This contained 28 pages of illustrated articles on various phases and developments of engineering with special reference to the mining industry. Interesting articles by Dr. C. C. Garrard, Mr. Theodore Stretton, and Mr. P. E. Rycroft on electrical matters were included.

Official visits were paid on November 24th by the South Wales branches of the Association of Mining Electrical Engineers and the Colliery Managers' Association. The visitors were welcomed by Mr. W. O'Connor and Prof. G. Knox (president-elect of the South Wales Institute of Engineers). The latter emphasised the need for the replacement of mechanical by electrical plant in mines to secure the maximum efficiency. The organisers were thanked by Messrs. T. S. Thomas and W. W. Hannah, president and vice-president, respectively, of the South Wales branch of the A.M.E.E., while Mr. W. T. Anderson (past-president of the Association) referred to that body's work to raise the status of its members in the industry.

Electrical Accidents in Mines.

Report of H.M. Inspector of Mines for the Year 1927.—*Abstract.*

(*Concluded from page 889.*)

Non-fatal Accidents and Dangerous Occurrences.

Notices were received of 51 notifiable non-fatal accidents and dangerous occurrences attributable either directly or indirectly to the use of electricity, involving injury to 53 persons, in addition to eight persons injured non-fatally in two of the fatal accidents. All of these accidents occurred at collieries; 36 below ground and 15 above ground. Included in the total there were three cases of the ignition of firedamp, two instances of fire below ground and six accidents in which switchgear burst while in use. The following cases have been selected from the report.

Elm No. 3 Pit, Flint.—A bar-type coal-cutting machine driven by a 500-V d.c. motor was being started for the first time in the shift, the bar being in the coal in a 22-in. seam, when firedamp was ignited. It was found that one of four set screws which were used for attaching the cover of the switch box to the flanged face was missing, thus leaving an open hole about half an inch in diameter into the switch enclosure. The machine was an old one and, apart from the specific defect that was found, the design did not fulfil present day requirements in the matter of flame-proof enclosure. A local defect in the ventilation was a contributory cause.

Morlais Colliery, Carmarthen.—A chain-type coal-cutting machine driven by a 3-phase, 500-volt motor was at work undercutting, in the coal, a seam 4 ft. 6 in. thick when the trailing cable, which was lying on the top of the machine, was dislodged by a small fall of coal from the face at the jib end, so that it fell upon the exposed portion of the cutter chain and was drawn into the cut and severed by the picks. The arcing resulting from this injury to the flexible cable ignited firedamp, which continued burning in the break above the coal for a distance of some ten yards. Owing to the narrowness of the passage, the trailing cable could only be laid over the top of the machine to reach the plug box when travelling in one direction, with respect to the gate-end switch box which was situated in a gate road approximately in the middle of the long wall face. The trailing cable was of the usual 4-core cab-tire-sheathed type. It is hardly to be expected that even with leakage protection open-sparking in an unarmoured cable could be prevented under the conditions of this accident. The remedy would appear to lie either in providing more gate-end boxes, so as to avoid the necessity of doubling the trailing cable back over the top of the machine, or in protecting and holding the cable, while in that position, by mechanical means.

Sutton Colliery, Notts.—A fall of roof occurred on a main road and damaged an armoured cable so as to bring about a short-circuit, which set fire to the cable insulation and to some timber. The cable was 2-core, .06 sq. in., insulated and sheathed with bitumen and armoured with a single layer of steel wires; the system was d.c. 500 volts. The insulation of the circuit had been tested four days previously and the result had been recorded as two megohms. A non-selective leakage trip device was in use. This was applied to a circuit-breaker at the distributing centre in the pit. The overload setting of this circuit-breaker was said to be 240 A, and the leakage relay was said to operate with a leakage current, between mid-voltage point and earth, of 4 A. This circuit-breaker was found to have been tripped automatically. It would appear that the earthed armouring must have been involved at a later stage in the development of the fault, so that sufficient heat to start the fire had been generated before the leakage device operated to cut off the current.

Ashington Colliery, Northumberland.—An air-break two-way starting switch with an ammeter and with fuses which were switched into circuit in the running position was in use controlling a 7.5-h.p. 3-phase 500-V squirrel-cage motor driving a fan in the smithy. The switch was rated to carry 50 A, and the fuses were gauged to blow at 20/25 A. When the blacksmith attempted to start the fan the switch burst as he moved the lever to the starting position. It was found that a short-circuit had occurred between phases and there was evidence to suggest that this had been induced by a loose arcing connection to the ammeter. The fault was cleared by the blowing of fuses rated at 250 A at the origin of the workshop circuit, which comprised about 100 yards of 0.1 sq. inch 3-core cable.

Taff Merthyr Colliery, Glamorgan.—At a lodge room in the shaft there was a pump driven by a 3-phase 3,200-V squirrel-cage motor, with an oil-break circuit-breaker to start the pump by throwing the motor directly on to the line. The circuit-breaker was designed to carry 200 amperes with a rated runturing capacity of 20,000 kVA. It was equipped with two overload trips set for 63 A, with a time lag with inverse time-load characteristic and a leakage trip coil. The stator windings of the motor were brought to three small sweating sockets in a terminal box on the frame; the steel screwed stems to which these sockets, together with the much larger sockets on the end of the feed cable, were clamped were only about ¼ in. in diameter and were close together. When the pump attendant attempted to start the motor, there was an explosion in the circuit-breaker, with the result that the tank was torn away from the body of the circuit-breaker. It was found that there was a short-circuit in the motor terminal box, and it is presumed that in attempting to clear this fault the circuit-breaker flashed over between phases. The fault was cleared by the tripping of two other circuit-breakers between the lodge room and one of two 4,000-kVA transformers at bank that was on load at the time.

Barrow Colliery, Yorks.—This accident occurred in the colliery power house when the attendant attempted to break a small load current on the isolator preparatory to changing over from one source of supply to another. Fortunately the fault was only fed by a 500-kW, 500-V turbo-generator. The arrangement of the switchgear was crude and the correct sequence of operations was complicated. There were two colliery generators and also a power company's transformer, any or all of which could be used together or separately, to supply the colliery load. The switchgear enabled these changes in connection to be effected, but it was not so arranged or designed as to permit load to be transformed without interruption of service from one source to another, because the transference had to be effected through the medium of the isolating switches which, as this accident showed, could only be used safely after the circuit had been opened elsewhere.

Danger from "Live" Conductors.

During the year a Mines Department Circular (No. 23, dated June 21th, 1927) was sent to the owners, agents and managers of mines in which electricity is used, directing attention to the danger and to the requirements of General Regulation 131 (g) in relation thereto, and suggesting means whereby circuits might be earthed without risk to the operator. This circular was prompted by the too frequent occurrence of accidents by electric shock from apparatus or cables undergoing examination, test or repair.

The accidents referred to fall under two heads. On the one hand are those where work is begun or resumed upon conductors that are erroneously assumed to be "dead," without first earthing the conductors. On the other hand are those where an electrician proceeds to earth a circuit that he imagines is isolated by flicking contacts which are in fact "live," with the free end of a short length of cable connected at its other extremity to earthed metal. Both types of accident frequently result in serious personal injury and sometimes in substantial material damage as well. Eight typical recent accidents are described in the report. The principle advocated is that the circuit shall be put to earth through a circuit-breaker, so that if by any mischance the circuit is "live" the operation, which will be equivalent to closing the circuit-breaker upon a short-circuit, will not result in disaster for the operator, provided that the circuit-opening devices are adequate, as they should be, for clearing such a fault upon the part of the system that they protect. It is also necessary, of course, that the circuit-breaker which is to be used for putting the line to earth shall be capable of being closed upon a short-circuit at that point upon the system, without danger. With the aid of a diagram the circular suggests a simple method of applying this principle to circuits controlled by switchgear of the draw-out type, *i.e.*, by the use of detachable extension plug contact pieces. This method can be applied with very little constructional alteration to certain designs of switchgear of this type, a type which is largely and increasingly used at collieries both above and below ground.

British Engineering Standards Association.

During the year further progress has been made with the following specifications for electrical equipment for colliery purposes, under the direction of the Colliery Requisites' Sectional Committee.

(*a*) Flame-proof air-break switches for a.c. and d.c. voltages not exceeding 660 volts (Revision of B.S.S. 126);

(*b*) Flame-proof air-break circuit-breakers for a.c. and d.c. voltages not exceeding 660 volts (Revision of B.S.S. 127);

(*c*) Mining type transformers, up to 300 kVA, 3-phase (embodying B.S.S. 171);

(*d*) Cable glands and sealing boxes for 250, 660, 3,300, 6,600 and 11,000 volt cables;

(*e*) Underground lighting fittings;

(*f*) Mining type motors and generators for voltages not exceeding 7,000 volts (embodying B.S.S. 168).

(*g*) Bulbs for miners' hand lamps.

As there is still considerable misunderstanding concerning the object and even the value of the specifications that are prepared by the British Engineering Standards Association, it is worth while pointing out that they constitute in effect, as between buyer and seller, the equivalent of an agreed system of weights and measures, facilitating comparison of values and saving time and money. Moreover, in their technical provisions these specifications represent the collective wisdom of a large number of specialists and indicate the high-water mark for the time being of that which is reasonably and commercially practicable.

Metalliferous Mines.

During the year inspections were made at several slate mines in North Wales where the conditions appear to be static. There were, however, no reported electrical accidents at metalliferous mines. Out of 320 mines of this description at work, 77 used electricity, against 74 in the previous year. The total h.p. of the motors installed was 25,765, or 15,396 above and 10,369 below ground.

Quarries.

During the year several quarries were visited, one being the Waterlip Quarry for road metal, in Somerset, where there is an interesting application of self-propelled wagons of the railway type drawing power from a live rail. The electrical circuits are arranged so that the wagons can be controlled from a centrally placed control tower by switching current on to the sectionalised live rail. There were no reported electrical accidents at quarries, but there are undoubtedly many instances where the opportunity for accident exists owing to shortcomings in the installations, and I have formed the opinion that a simplified and short explanatory memorandum upon the Electricity Regulations applicable to such installations would be a useful production.

Rural Electricity Supply.

The results of a survey carried out with the intention of making electricity available to every dwelling in a poor and sparsely populated area of 106 square miles near Aylesbury.

By W. A. TURNBULL, Wh.Ex., A.M.I.E.E., A.M.Inst.C.E.

(*Extracts from Paper read before the* OVERHEAD LINES ASSOCIATION.)

TO the north of Aylesbury (Bucks.) there is an area of 106 square miles, containing 3,035 dwellings and a population of 11,579, poor and sparsely populated, in which the density of population of 109 persons per square mile is definitely considerably below the average; there are no factories, and apparently no village industry.

With a view to finding out the possibilities of making electricity available to every dwelling in the area, it has been surveyed and representative districts closely inspected. All the dwellings in the selected districts have been classified and given an estimated revenue, which indicates an ultimate revenue of £5,171 from 858 consumers; the estimated ultimate revenue from those consumers for light only is £2,324. Thus we found :—

Number of dwellings	832 with a revenue of	£4,651
Number of farms ...	26 with a revenue of	520
Total	858 with a revenue of	£5,171

To the dwellings as stated below has been added revenue proportional to the above :—

Total dwellings	2,849 with a revenue of	£15,900
Total farms ...	186 with a revenue of	3,720
Grand total ...	3,035 with a revenue of	£19,620

The proposed tariff is to be that existing in the other parts of the Aylesbury rural area, namely, a standing charge of 1s. per 10 sq. ft. of outside base area, plus 1½d. per kWh, and 4d. per kWh for power up to 500 kWh, afterwards 2½d. per kWh. The intention is that 10d. per kWh will be paid for light and 1½d. per kWh for other domestic uses. The small amount of power that will be used is neglected in the following estimates :—

Consumption of Electricity.

To discover the amount of energy that will be used and the demand, the lighting revenue has been estimated at £2,324 for 858 consumers, or, *pro rata*, £3,200 for the total 3,035 consumers for light, leaving £11,420 revenue for other uses, from which the following figures are assumed :—

197,000 kWh at 10d.	per kWh	£8,200
1,820,000 kWh at 1½d.	per kWh	11,420
2,017,000 kWh at 2.34d.	per kWh	£19,620

About six months will be needed to obtain the necessary wayleaves and sanctions; then it is assumed that two years will be needed to construct the scheme, the second year to be designated the first year of working (although a small amount of revenue will be received during the year previous). It is now assumed that 50 per cent. of the dwellings will be connected at the end of four years' complete working, which should result in the following consumption and revenue :—

98,500 kWh at 10d.	per kWh ...	... £4,100
910,000 kWh at 1½d.	per kWh	5,710
1,008,000 kWh at 2.34d.	per kWh ...	... £9,810

This gives an average revenue for light only of £2.7 per dwelling connected per annum. At Aylesbury we get £3.16 for light from private houses and shops. Allowing for the greater percentage of shops and the higher standard at Aylesbury, compared with the area in question, the figure of £2.7 does not appear to be far out. From an analysis of the Aylesbury load curves it is estimated that the demand from private houses at the time of winter peak is 140 watts per house, which should be a liberal allowance per consumer in the rural area, which indicates a demand of 212 kW for the 1,517 consumers at the time of winter peak, from 4.30 to 5.30 p.m. Allowing 20 per cent. loss in distribution, this gives 1,260,000 kWh generated, or purchased at 265 kW demand. Few undertakings could not generate that additional electricity at £3 per kW and 0.3d. per kWh, so that, taking those figures, we get the cost of electricity :—

265 kW at £3 per kW	£795
1,260,000 kWh at .3d. per kWh	1,570
Average price of 1,260,000 kWh at 0.436d. per kWh	£2,365

The apparent load factor on the above is 54 per cent.; the experience in the Aylesbury district is that no "visible" cooking takes place at the time of peak load, and nothing is allowed in the kW charge for any cooking load. The lighting l.f. of 4¼ per cent. shows the conservative basis of the estimates.

Construction of Lines.

All the constructional work is designed to comply with the recent rules and regulations of the Electricity Commission.

Transmission.—The main 11,000-volt three-phase line will consist of 7/12 s.w.g. 45-ton galvanised steel wire on 11-in. poles, 400 feet apart, 4 ft. 4 in. sag; 11,000-volt single-phase branch lines to small villages and farms will consist of 7/14 s.w.g. galvanised steel wire on 9½-in. poles, 360 feet apart, 5 ft. 10 in. sag, each pole being earthed instead of using an earth wire. The poles will be 38 ft. tall, 6 ft. below ground level.

Distribution.—The lines will be on poles giving 15 ft., 17 ft., and 19 ft. clearances where necessary, two and three wires for single-phase 220- and 440-volt working, and four wires for three-phase working; the sizes of the wire will be 3/0 and No. 2 s.w.g. copper, the area being practically 0.1 and 0.06 sq. in. The poles will be approximately 7 in. in diameter and 26 ft. tall, 4 ft. 9 in. below ground.

Capital Cost of Distribution.—

20 miles of 3-wire, No. 2, at £255 0s. 5d. ...	£5,100
8 miles of 2-wire, No. 2, at £196 18s. 9d. ...	1,575
2 miles of 4-wire, 3/0, at £465 4s. 4d. ...	930
Total	£7,605

Capital Cost of H.P. Transmission Line.—There will be 31 miles of three-phase and 48 miles of single-phase lines; adding 10 per cent. to allow for deviations will give :—

34 miles of 3-phase at £240 7s. 7d.	£8,173
53 miles of 1-phase at £149 11s. 0d.	7,926
Total	£16,099

Transformers.—There are 24 villages in the area; four of them will require 50-kVA and the remainder 25-kVA transformers. The farms are often in pairs, with the result that one transformer will supply, in many cases, two or even three farms. In such cases I am allowing two 3/0 230-volt services to the farms. I estimate 9 miles of this and 66 transformers for the farms, half of which I assume will be connected :—

Village transformers— 4 at £80 13s. 6d., 50 kVA	£322	14 0
Village transformers—20 at £48 14s. 0d., 25 kVA	974	0 0
Farm transformers—½ of 66 at £31 4s. 6d., 10 kVA	1,030	8 6
Total transformers	£2,327	2 6
Farm distribution—3/0, ½ of 9 miles, at £273 per mile	£1,228	0 0

Capital and Operating Costs.—The total capital cost will be as follows:—

High-voltage transmission		£16,099
Low-voltage distribution in villages		7,605
Low-voltage distribution to farms		1,228
Transformers		2,327
		£27,259
Services—1,517 at £3 0s. 0d. ...	£4,551	
Meters—1,600 at £1 10s. 0d. ...	2,400	
		6,951
Clerk of works for 2½ years		870
Additional management during construction ...		200
Total		£35,280

The running expenditure has been estimated as follows during the fourth year of working:—

Repairs, maintenance and operation, 1¼ per cent. of capital, doubled due to steel wire and sparse population	£870
Canvasser and motor-cycle	250
Rent, rates and taxes, 1¼ per cent. of capital ...	391
Wayleaves—1s. each for 1,200 poles	60
Meter reading	250
Management (additional)	500
Total	£2,321

Hire of Apparatus.

Apparatus will be hired out at a low rate, namely, cooker with kettle for 6 persons at 6s. 9d. per quarter, for 4 persons 5s. per quarter, "Protos" oven and kettle 3s. per quarter, all fixing and wiring free. These charges will not cover the capital cost and repairs; therefore, ½d. per kWh used for other purposes will be allocated to the hire and maintenance of apparatus (namely, 910,000 kWh at ½d.), £475, reducing the revenue from the sale of electricity from £9,810 to £9,335.

Capital and Revenue.

Assuming that money can be borrowed at 5 per cent. and that for three years the payment of sinking fund and interest will be suspended, then the sinking fund and interest on the annuity principle will be £8 15s. per centum per annum. By adopting this method, the losses during the first three years of working will not have to be met, and there might be a small reserve to commence the fourth year of working.

The revenue report will be as follows:—

Cost of electricity	£2,365
Running expenses	2,321
Capital charges, 8.75 per cent.	3,088
Total cost	£7,774
Revenue	9,335
Profit	£1,569

In the foregoing estimates nothing has been allowed for the cost of raising capital, or such contingencies as bad weather, or litigation on wayleaves, but those amounts should not be so serious as to affect the estimates. It is also assumed that the undertaking has an engineer and staff available, experienced in this work, to design and supervise the scheme free.

With regard to wiring the houses, a hire-purchase scheme, charging 1d. per point per week for six years, will apply; alternatively, an additional 2d. per kWh through slot meters to pay for the wiring. All types of electrical apparatus will be hired, or hire-purchased, by consumers.

I do not think there would be difficulty in getting the 50 per cent. of possible consumers in the four years, providing appropriate canvassing can be employed, as the people are already aware that electricity is used in towns. As the supply becomes familiar, electricity will be used for street lighting, for power on farms, and for the village sewage and waterworks, and the area should generally develop above the present low level.

Conclusions.

From the foregoing conclusion that a universal supply of electricity is a profitable proposition in such an area, it would appear that a universal supply could be made available to every habitation in England and Wales. I consider it wrong to select only the more profitable consumers in an area, to the exclusion of the less profitable ones, which may lead to the sale of electricity for a time at lower rates; but, eventually, the undertaking which gives a broader supply will overtake the more conservative concern. No electricity supply authority should be allowed to reduce its rates of charge, or pay high dividends, so long as there are prospective consumers in its area willing to take supplies. The exceptional case of a most unprofitable prospective consumer could be subject to appeal.

Discussion in London.

Mr. W. M. SELVEY remarked that some years ago, when Mr. Turnbull first conceived the idea of giving a supply in the rural districts around Aylesbury, he persuaded his Electricity Committee to call him (Mr. Selvey) in to back up his proposals. At the time both he and Mr. Turnbull had fairly open minds as to the possibilities: he would, however, recommend all who were interested to go and see what had been done by Mr. Turnbull already in his area, and he did not believe that the new scheme would fall short of what was anticipated.

Mr. BARTLEY (British Aluminium Co.) presumed it was proposed to use galvanised-steel wire for the overhead lines on the ground of low first cost, but they must consider the scrap value of such lines, when the galvanised-steel wire had to be taken down. He suggested that one of the aluminium alloy conductors that were available should be considered in preference to galvanised steel because, although the alloys were a little more expensive in first cost, their conductivity and strength were greater, and they had a good scrap value. Moreover, it had been found that such conductors could be used with poles at intervals of 250 ft., as against 150 ft. proposed by the author, thus reducing the total cost. There were various other items, such as reduced wayleave rentals owing to fewer poles per mile and, further, aluminium alloy conductors were cheaper than copper, which was suggested for the low-voltage distribution system. The objection had been raised that aluminium conductors corroded, but alloy conductors had been submitted to many corrosion tests, for instance, on certain islands off Germany where the conditions were very bad from the corrosion point of view, and they had stood up well for several years. Aluminium alloy cables were at present used in Switzerland and France under actual practical conditions, whilst the French Telegraph Authorities had signified willingness to adopt such cables. Hence the use of aluminium alloy was worthy of consideration.

Mr. C. GAUVAIN, in a long written communication, said he had been responsible for work (aggregating a capital cost of £1,000,000) overseas in the Dominions of a similar nature to that now proposed by Mr. Turnbull. The use of galvanised iron wire for such distribution work was not new: he had been aware of it in that connection for 16 years for 11,000-volt distribution. In some cases its use was an advantage, but he regarded its use as indicative of a want of optimism concerning the possible development of such an area. It would be interesting to know the difference in the cost of copper for such work and its greater carrying capacity. He expressed doubt whether really efficient transformers could be provided for the figures estimated and also criticised a number of other details of the scheme having regard to the fact that the outstanding feature of rural electrification must be reliability and service.

Mr. F. H. CLOUGH (B.T.-H. Co.) expressed the view that there was a prospect of making a reasonable profit on the scheme outlined in the paper. He suggested that three-phase distribution should be considered seriously instead of single-phase, on account of the probable development of the motor load and the higher cost of the single-phase motor. The figure of revenue per head of population was a little under £2, and it was interesting to compare it with the £2 10s. given in the Electricity Commissioners' report on rural electrification as being necessary to show a reasonable return on capital for such schemes.

Mr. R. J. JOCELYN SWAN thought the low-voltage line poles proposed were a little on the small side and, incidentally, he would like to know where such poles as those proposed could be obtained for 24s. each, as stated in the paper. He agreed with the desirability of having three-phase distribution all over the area.

Major THEODORE RICH congratulated the author on the manner in which he had brought down supply to villages and rural areas. The figures given in the paper were comparable with many in other countries. It was no use installing copper wire to a village capable of carrying very much more current than would ever be demanded and burdening the undertaking with the extra cost of that copper; therefore, the use of galvanised steel wire was a wise step. Aluminium alloy cables to some extent piled up the loading on the poles from the point of view of the strain that had to be allowed for; personally, he believed there was a future for that class of work for copper-clad steel, or some of the copper alloys.

Mr. F. M. LONG (city electrical engineer, Norwich) did not think they would get very large consumptions in rural areas for cooking and heating, &c., unless the price was kept near 1d. per kWh, whereas the author had allowed 1¼d. per kWh. He doubted whether the author would get his estimated consumption of 175 kWh per head of population per annum if he kept the price of energy for "other purposes" at 1¼d. per kWh. He was putting up a line of copper-cored steel wire which enabled the capacity of a line to be doubled at very little cost. It was a seven-strand cable, the centre strand being copper, instead of steel, and it enabled the capacity of a line to be doubled for £30 per mile.

Mr. NAPIER PRENTICE regarded the figures in the paper as conservative, except the load factor of 5¼ per cent., which he thought was on the high side. Even with a 33 per cent. load factor, however, the scheme would still be a good one.

Mr. W. FENNELL, president, whilst congratulating Mr. Turnbull on having prepared a business-like scheme, did not agree with the policy of providing for a supply to every house in the area. That really was not feasible where the houses were miles apart and, moreover, that policy led to complaints from consumers in the towns that they were being made to pay higher charges to meet the cost of supplying the outlying areas; gradual development was the best policy. He agreed

with putting the high-voltage and low-voltage lines on the same poles, he having done so successfully for three years.

Mr. P. F. ALLAN did not feel very optimistic about the scheme and suggested that a considerable sum would have to be added to provide for supervision, &c., of which no account appeared to have been taken in the paper.

Mr. SWARBRICK also raised the question of the extent to which rural supplies would be provided, at first, at the expense of the town consumer, and urged considerable caution in dealing with such schemes.

Mr. W. A. TURNBULL replied to many of the points raised in the discussion, defending his scheme in view of the experience he had already had in other parts of the country surrounding Aylesbury.

Tendencies in Installation Work.

Some of the more obvious tendencies of the passing present, particularly as they affect the installation engineer.

By D. SMEATON MUNRO, M.I.E.E.

(Extracts from Chairman's Address before the SCOTTISH CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS *at Glasgow.)*

THE outstanding merit of the national electricity scheme is that it compels everyone to think about electricity supply, and so is the best advertisement the entire industry could hope for. Even if, as some think, the fuel economy of super-power steam stations will be absorbed in transmission and administrative costs, the general permeation of the population with electrical ideas and desires must ultimately be of benefit to all, and the great diversity of requirements will tend inevitably to reduce cost of supply; then the great purpose of the scheme will be justified.

The installation engineer can look on the present situation from a comparatively detached and, on the whole, favourable aspect: he may be losing by the hundred the smaller self-contained installations which it had been his pride to design and maintain, for the majority of his clients will find it expedient to change over to the standard supply services, but he should see to it that the opportunity be taken to extend the range and capacity of the consuming appliances.

As the great bulk of consuming appliances will be produced in mass for standard pressures, the installation engineer will assist the natural tendency to install such appliances so that consumers may at minimum cost accept the advantages of unlimited supply, where and when it becomes available advantageously.

Private Plant.

Some important industries and large institutions, asylums, and the like, require so much steam heating that apparently it will always be advantageous to generate electricity as a by-product. Isolated country houses are plentiful in the Scottish Highlands and islands, and there should be no tendency to wait on Government schemes when wind and water, petrol and oil, are immediately available. Recent improvements in the automatic control of small plant and the greatly increased efficiency of engines using low-grade fuel oil have enabled installation engineers to introduce electricity into many districts at very low running costs. Even in lowland areas with overhead supply lines within a mile or two, owners of country estates to-day frequently find the installation cost of private plant considerably less than that of a transformer and service line, and so are doubly induced to preserve their independence and the amenities of their policies. The consequence of failure become increasingly serious as more industrial applications tend to be entirely dependent on electricity, and some important business enterprises take the view that super-stations with large sets, plus involved new distribution networks, are unlikely to eliminate the possibilities of interruption. With giant sets and large-capacity cables, novel and more active causations and accompaniments of stoppage must be anticipated. In 1928 private generating plant was producing over 5,000 million kWh.

Direct-Current Applications.

Apart from detached and completely independent installations, there is already evident a tendency to increase the use of motor-driven generators, rotary convertors, and static rectifiers for purposes for which direct current is necessary or most desirable. The extreme simplicity and effectiveness of the d.c. constant-current system for purposes for which the steam engine even yet holds the field opens up new prospects for this necessarily self-contained generator and motor system, which is being developed in Glasgow and is being applied to the auxiliaries of our most up-to-date all-electric ships.

There are abundant directions in which the installation engineer may exercise his functions in the great change-over which is taking place: the fact that motors have to be replaced often leads to more or less complete rearrangement of workshops and the conversion of lift, fan, and refrigerator drives in towns and villages. The adoption of electricity for farming and all the processes of agriculture and horticulture can truly be said to be in its infancy, compared to the expansion we expect to attain under the national scheme.

Electric Heating.

The chief likelihood of the "off peak" problem being solved in a satisfactory way is by the application of electricity on a wide scale to heat-storage systems. The selection of position, type, and size of boiler and tank and the applications of the varied styles of elements in themselves offer much scope to the installation engineer. The arrangement and design of the thermostatic and time-switch controls for the manifold domestic requirements and tariffs give ample opportunity for improvement and invention. The more general use of alternating current is in itself giving us distinctly new methods of heating. For large works, blocks of offices, and possibly for communal supplies, the direct heating of water in large boilers by means of three-phase electrodes at the higher pressures affords obvious economies, and at the same time suggests further methods of facilitating many chemical processes by electricity.

Electric Illumination.

All the problems of illumination come within the purview of the installation engineer. Artificial lighting has gone far beyond its primitive purpose. There is a steady tendency to increase illumination, and a movement to embody fittings in the pillars, cornices, ceilings, and walls of the structure; new tints and forms of glass and other translucent materials are being pressed into the service of the installation engineer; modern application of cut and rippled glass panels, transparent floors and ceilings, and the use of coloured surfaces for reflected and refracted lighting, provide examples of electric light being employed to produce an effect in itself different from the primary purpose of illumination. The desire for distraction, or entertainment, by the play of light and its use to express, or influence, moods or emotions, indicates possibilities far beyond the utilitarian.

Wiring

Forty years ago there was a demand on the one hand for a cheaper system of wiring, and a protest from the other that prices were inadequate to provide the necessities of good wiring; these two voices have still a familiar ring. So-called systems continue to multiply, but most of them fail in some way to meet the requirements which experience has shown to be necessary for sound and lasting work. A complete screwed steel draw-in and draw-out installation is now fairly generally admitted to represent the best standard practice.

The annoyance and confusion formerly occasioned by the variety of two-pin sockets now tends to be continued by the too many types of three-pin socket which have come into use during the last three years. It is unfortunate that the very recently standardised 5-ampere three-pin socket is so large that it cannot be fitted within the boxes used for the displaced two-pin pattern, and it is much too clumsy to become popular for portable lamps in houses. This petty point is illustrative of the multitudinous problems of detail which go to make up wiring.

At present the divisions of our industry are hampered by certain confusion of function, the reasons being more political and financial than scientific. We must aim at maximum efficiency and eliminate the internal wasteful friction induced by overlapping duties and cross-purposes.

An Electrically-operated River Dredger.

An electrically-operated river dredger, described as the first of its kind, has recently been put in service on the River Danube by the Austrian State Danube Regulation Board. The hull of the vessel was built by the Linz Schippswerft Gesellschaft of Linz and the Diesel engines by the Climax Motorenwerke Gesellschaft of Vienna. The electrical equipment was supplied by the A.E.G. Union Elektrizitats Gesellschaft of Vienna. The installation comprises three generators driven by Diesel engines with a total capacity of 126 kW. Altogether 14 motors are used, aggregating 220 h.p., for the driving of the continuous chain of dredger buckets and for the operation of various cranes.

Textile Machinery and Accessories Exhibition.

Electrical Features of the Exhibits.

THE absence of the leading electrical machinery firms was a conspicuous feature of the Textile Machinery and Accessories Exhibition which was opened in Manchester on November 14th. Three years ago, when this exhibition was held in Manchester, many of the leading firms took part, and their absence on this occasion is rather difficult to explain. Nevertheless, there were many features of electrical interest, the chief of which are noted in the following brief report.

Fig. 1.—Compensator Regulator for Stentering Ranges.

The increased use of the individual drive by textile machinists was very noticeable. It is perhaps questionable whether the proportion of manufacturers using the individual drive in their works is as great as might have been supposed from a visit to this show, but there is no doubt that better trade conditions in the cotton industry will open up a big field for electrical engineers in this direction.

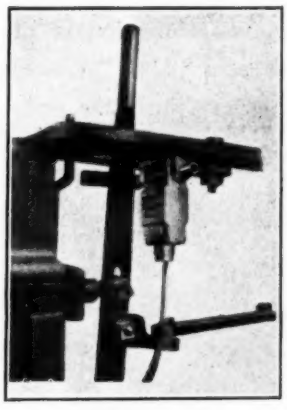


Fig. 3.—Knock-off Motion ("Electric").

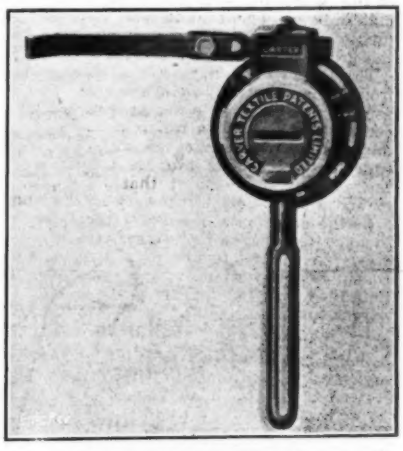


Fig. 4.—Knock-off Motion ("Non-electric").

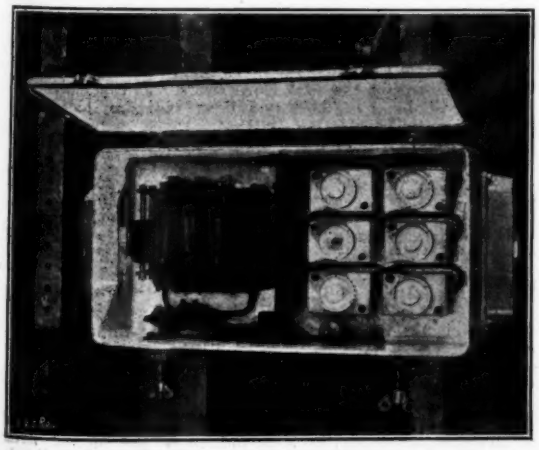


Fig. 2.—Straight-on Inching Starter with Double Fuses.

The exhibition organisers have now purchased transforming plant in order that the power requirements of exhibitors may be arranged for. This will be moved to other centres, wherever the exhibition is held, and the plant is required.

Messrs. BROOKHIRST SWITCHGEAR, LTD., exhibited several textile controls, including a compensator regulator for stentering ranges, fig. 1. This is designed to take up any slackness in the cloth brought about by the speeds of the mangle and the stenter being out of step. An idle roller or compensator, in the bight of the cloth, falls as the cloth slackens. In doing so, it operates the regulator by a chain, thus speeding-up the motor and tightening the cloth. As the idle roller rises, it operates the regulator in a reverse direction, and slows down the motor. The firm also showed an inching straight-on starter, fig. 2. This has been designed for the control of motors driving slubbing frames, roving frames, &c. The exhibit shows a roving frame end with motor and starter. By means of special double fuses, the starter provides complete protection for the motor, both during starting and running. A feature of this drive is that the starter is operated by the "push-rod" which runs the whole length of the frame. This is of advantage, as it enables the starter to be operated from any position, and actually reproduces the identical cycle of operations to which the worker has been accustomed before conversion to electric driving. The "push-rod" can also be used for "inching" the motor, when required for the frequent operation of "piecing up." A standard "safety first" drum-type starting panel was also shown, suitable for the control of bleaching and finishing machinery, such as wash mills, hydraulic mangles, &c., and a similar type of control panel, but arranged for push-button control for starting and speed regulation, which has been widely used for the control of dyeing and printing machinery. Switchgear supplied by Brookhirst's was seen on several stands.

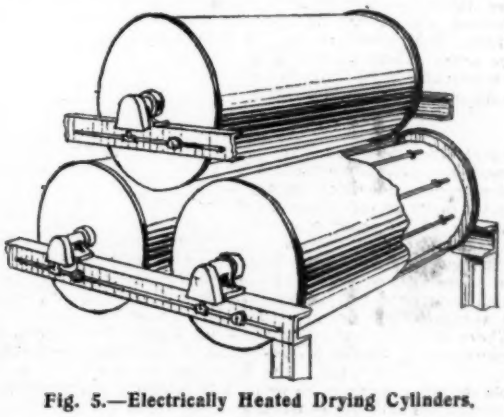


Fig. 5.—Electrically Heated Drying Cylinders.

THE CARVER TEXTILE PATENTS, LTD., which showed an ingenious electric jacquard loom at the 1925 show, on this occasion demonstrated its warp-stop motion, in which the electrical arrangements are very interesting. The spring-wire motion for plain leases controls two threads by one

spring-wire which springs forward, when a thread breaks, and stops the loom by touching the lease-rod, showing at the same time the position of the broken thread. The electrical arrangements have been so perfected that while extreme simplicity of action, by mere contact between the detector and the lease-rod, is secured, no inconvenience is involved because, whether the supply is high or low pressure, the circuit closed by the detector is of such low voltage that the action is absolutely sparkless. The drop-wire motion for mixed leases controls one thread by one drop wire, which falls when a thread breaks and stops the loom by touching the lease-rod, showing at the same time the position of the broken thread. The knock-off motion is easily and quickly fitted, and requires only a small and sparkless current. Two types are supplied. In the first (see fig. 1) the actual force required to knock the handle off, which is sometimes considerable, is supplied by a moving part of the loom itself, and not by the electrical mechanism, which only acts to cause a locking effect, bringing the outside force into play. In the second type (see fig. 3) the motion is fixed under the handle-plate of the loom in such a position that when the handle is pressed into the starting position, a spring is extended and locked, so that when current passes, by the breakage of a thread, the lock is released and the spring given freedom to act to throw the handle off. Both of these knock-off motions can be fed either from separate wiring or from any system, at whatever voltage, already installed in the mill for lighting or power.

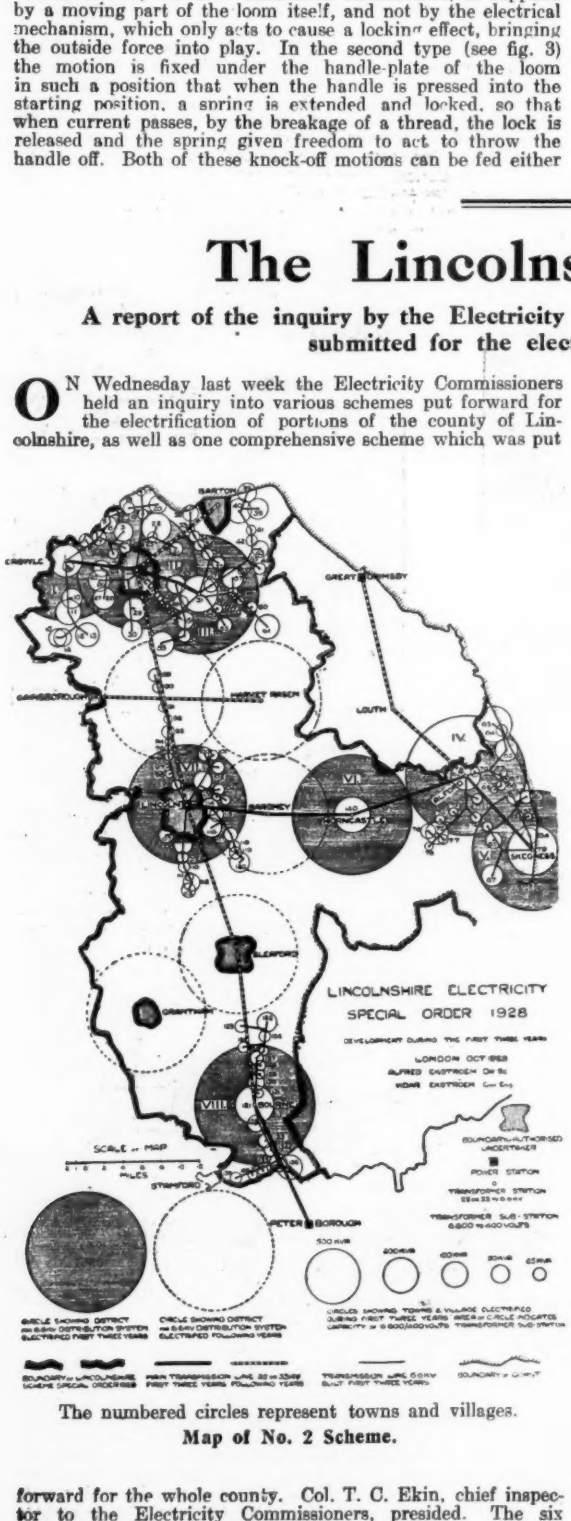
Messrs. Lang Bridge, Ltd., showed a patent electrically-heated drying cylinder, three of which are depicted in fig. 5. This consists of a stationary inner cylinder mounted on a hollow shaft, and a thin outer shell on ball bearings which rotates freely round the stationary cylinder. The heating elements are mounted on the surface of the inner stationary cylinder and heat up the small annular space between the inner and outer shells. The inner shell is insulated to keep the heat in the cavity. The temperature of each cylinder is controlled by switches giving different degrees of heat, which may be, if required, at temperatures which would be dangerous with steam. It is understood that the cost compares favourably with that of other heating methods.

Other exhibits of interest to Review readers included those of Laminated Gears, Ltd.; Messrs. Dobson and Barlow, Ltd., with their latest individual spindle drive type of artificial silk centrifugal spinning machine; Messrs. T. Broadbent & Sons, Ltd., with their electrically-driven 48-in. hydro extractor (in which the motor is direct coupled to the cage spindle without clutch); Messrs. Hindle, Son & Co., with their electric baling press, previously described in these pages; Benninger, Soc. Anon., Schmidt electric stop motion and indicator; and P.I.V. Chain Gears, Ltd.

The Lincolnshire Inquiry.

A report of the inquiry by the Electricity Commission's chief inspector into schemes submitted for the electrification of the county.

On Wednesday last week the Electricity Commissioners held an inquiry into various schemes put forward for the electrification of portions of the county of Lincolnshire, as well as one comprehensive scheme which was put forward for the whole county. Col. T. C. Ekin, chief inspector to the Electricity Commissioners, presided. The six Orders under consideration were as follows:—



The numbered circles represent towns and villages.

Map of No. 2 Scheme.

(1) The application of the Yorkshire Electric Power Co. to supply towns in the Isle of Axholme.

(2) The application of the Yorkshire Electric Power Co. to supply towns in the Gainsborough area.

(3) The application of the Boston and District Electric Supply Co. to supply Skegness and Spilsby.

(4) The application of the Bourne Urban District Council.

(5) The application of the Mablethorpe and Sutton Gas Co., Ltd., to supply electricity for the same area as that in which it supplies gas.

(6) The application of Mr. R. Borlase Matthews to supply all the streets in 140 towns and villages within the first three years (proceeding as rapidly as possible with the remaining 236 towns and villages).

The last-named scheme (No. 2) has the support of the County Councils of Lindsey and Kesteven. It seeks powers to supply the whole of the area of Lincolnshire at present outside the area of a supply undertaking, and is said to provide for a cheaper supply than any other scheme. The total area of the county is 2,761 sq. miles, with a population of 602,200 persons; the scheme (No. 2) covers an area of 1,863 sq. miles, with a population of 219,000 persons, including 12 urban districts, 14 rural districts, 376 villages and townships, and 47,600 buildings. Electricity supply in bulk is available at Lincoln, Peterborough, and Grimsby (municipal undertakings), and at Scunthorpe (blast furnace gas-driven plant of the Appleby Iron Co., Ltd.). When the "grid" of the Central Electricity Board is developed, these stations will be connected with it.

The technical details of the No. 2 scheme have been worked out by Dr. Alfred Ekström, M.I.E.E., and his son, Mr. Vidar Ekström; the accompanying map shows the lay-out adopted, which contemplates the completion of the 6,600-volt distribution systems within the first three years. The primary distribution will be by 33,000-volt lines radiating to suitable centres from the generating stations.

Messrs. Ekström have made a close survey of the area and based the electrification scheme mainly on the domestic demand; it is intended to give about half the population in the area of the Special Order a supply attaining within four years an average of 75 kWh per head of the total population per annum. The electricity then to be generated is estimated at over 10 million kWh per annum, the load factor at 22.8 per cent. at the power station and 8.6 per cent. on the low-pressure lines. In the initial stage the cost of electricity in bulk will be 1.2d. per kWh; from the Central Electricity Board it is expected to be £3 10s. per kWh plus 0.23d. per kWh, which, at a load factor of 22.8 per cent., works out at 0.65d. per kWh. Consumers will be charged on a two-part tariff, the unit price being 1d. This is estimated to give an average price of 3.5d., gradually coming down to 2.5d. per kWh. The estimates have not taken into consideration the possible agricultural and industrial loads, which would materially improve the figures.

The capital to be expended in the first four years is estimated at £335,000; the consumers connected at that time are estimated to number 12,600, and the units sold over 7½ millions per annum. Operating costs (including sinking fund) are estimated at £53,090, and revenue at £83,790, leaving a balance of 9.2 per cent. on the capital. The revenue per service is put at £6.65. It is proposed that the company shall provide the capital for wiring the house of each consumer with

five lighting points and two plug outlets, the wiring being done by local contractors; the consumer will repay the cost of wiring by quarterly instalments.

Mr. Ralph Bury, who supported Mr. R. Borlase Matthews's scheme, explained that he opposed the other applications on behalf of the Lindsey and Kesteven Councils and 16 other authorities, saying that he was bound to put forward the view that the county should be served as a whole.

Mr. P. Donald, in putting forward the applications of the Yorkshire Electric Power Co., said he estimated the expenditure in the Isle of Axholme would enable the company to supply 400 consumers and to sell 160,000 kWh, at an average price of 4d. per kWh. The whole of the local authorities, both in Lincolnshire and Yorkshire, who were concerned in the scheme were supporting his application. In 1927 the Power Company was supplying over 130,000,000 kWh, at an average price of 0.855d. per kWh, and it was one of the cheapest supplies.

As regarded the second scheme, it was advantageously placed, and would be able to supply the north area from Thorne Colliery by radiating mains, and within the next few months be in a position to run another main through to Gainsborough. Regarding the work being carried out in a reasonable time, the company was in a position to give an efficient supply in each area immediately. It proposed to spend £21,460 in the Isle of Axholme in the first two years, and in the second area, in the same period, £83,500. In the second period the proposal was to increase the amount of the expenditure from £21,000 to £27,000, and the number of consumers would be increased from 400 to 500. For the second scheme it was proposed that the £83,000 spent in the first years be increased to £157,600, the number of consumers from 1,200 to 2,500, and the electrical energy from 480,000 to 1,500,000 kWh, the average price to be decreased from 4d. to 3½d. per kWh. Regarding the third period, the estimated expenditure for the Isle of Axholme was £38,650, and it was hoped to supply at an average price of 3½d. per kWh, 360,000 kWh to 600 consumers.

Mr. W. B. Woodhouse, engineer and manager of the Yorkshire Electric Power Co. and Yorkshire Distribution Co., said that in the Power Company's area there was a considerable number of urban areas of importance, and in the 111 local authorities' areas in which it gave supplies there were 17 rural districts. In the Wetherby district his company had spent £70,000 within two years of the making of the Order. The Distribution Co. was supplying 82 farms, and the Power Co. 15 farms in the area; the latter number would be increased by the end of the year by a further 15 or 20. The problem of the electrification of agricultural areas was a difficult one, because one had to spend a great deal of capital on distributing mains, and it was more economical for some people to use oil engines and other methods of power making than electricity. Referring to Mr. Matthews's scheme, Mr. Woodhouse said he would condemn any scheme that had not an existing supply, because development depended upon capital being raised from time to time at the lowest possible rates. In reply to a question as to how it was proposed to carry power over the River Trent, he said that at Gainsborough the power would be carried over at the bridge, and when it became necessary to carry it over the water at other places he had no doubt it would be conveyed overhead.

Mr. Burrows, clerk to the Isle of Axholme Rural District Council, said that his Council had expressed its approval of the Yorkshire Electric Power Co.'s scheme, but that it had neither agreed nor objected to Mr. Matthews's scheme.

Mr. Colly, clerk to the Gainsborough U.D.C., said that his Council approved of the Yorkshire Power Co.'s scheme, but disapproved the scheme of Mr. Matthews. Mr. David, clerk to the Glandford Brigg R.D.C., also gave evidence to this effect.

Mr. Auld, clerk to the Scunthorpe U.D.C., said that it had considered the Yorkshire Power Co.'s scheme, and was in favour of it. Its area received electricity from the Frodingham Ironworks, but it would be an advantage to have a stand-by.

Mr. H. E. Ringrose, clerk to the Bourne U.D.C., stated that it would be better for Mr. Matthews to distribute electricity in the Bourne area than for his Council to set up special machinery.

Mr. Sydney G. Turner, counsel for the Boston and District Supply Co., said that the company had its own generating station at Boston. The urban district of Skegness was rapidly growing; in 1911 the number of houses was 995, which had increased in 1921 to 1,250, while the winter population was 1,000. Three objections to the scheme had been made by the Spilsby R.D.C., Lindsey County Council, and Mr. Matthews.

Mr. F. E. Stanley, chief engineer to the National Electric Construction Co., Ltd., estimated that the power used in Skegness and in five other places on the way from Boston would be 200,000 kWh in the first year, rising by 100,000 kWh each year for three years, and on that basis he had estimated that 4½d. per kWh would be the average charge.

At the resumption on November 22nd, Mr. Hedley Thorton, chairman of the Electric Lighting Committee of the Skegness U.D.C., agreed that a scheme to cover the whole county was preferable to other schemes, but not necessarily from one source. Mr. W. B. Cowney, managing director of the Boston and District Electricity Co., Ltd., said the capital of the company had been provided by the Electrical Finance and Securities Co. for the whole of its three Orders now in operation, and that there would be no difficulty in providing capital for developments up to £500,000. It was stated that the question of supplying Skegness with electricity was not a new proposition, because four or five years ago a draft agreement had been prepared. In the meantime, however, a change had been made in the Council, and a consulting engineer had been called in who recommended that the Council should erect its own station, but his advice had been disregarded. Although electricity might be used with advantage on farms, he did not think it could be used extensively. If Mr. Matthews' scheme was accepted by the Commissioners, his company would be prepared to sell power to Mr. Matthews on certain terms. Mr. J. Wingate Saul, chairman of the Wainfleet Branch of the National Farmers' Union, stated that a resolution had been passed at a meeting of that body on November 16th supporting the scheme of the Boston & District Supply Co., Ltd.

The application of the Mablethorpe & Sutton Gas Co. and Bourne Rural District Council, which applied for a Mablethorpe and Sutton Order, was undertaken by Mr. H. T. Ringrose, of Bourne, who said that the Mablethorpe & Sutton Gas Co. had capital of £24,000, and was prepared to supply electricity in the same area in which it supplied gas. The area of the enlarged urban district was given as 7,172 acres, with a normal population of 5,238, which in the holiday season was increased three or four times. He was of the opinion that the scheme of Mr. Matthews would not serve the Mablethorpe district so effectively and as quickly as his scheme, and it was not fair to link that district up with the rural scheme, which was so entirely different in nature.

The case for Mr. Borlase Matthews was presented by Mr. C. Henderson, K.C., who said the scheme of the Yorkshire Electric Power Co. omitted a large part of the county. The scheme of Mr. Matthews was one affecting the whole area for rural electrification, and he decided that Lincolnshire presented the most suitable ground for his scheme because the county was the one in England in which agriculture was most extensive and intensive. It had also quite a good population for a rural area, and the location of the townships, villages and hamlets was such that the great majority of them could be supplied in a few years. The total area was 1,932 square miles, with a population of 219,000. As regarded the Order making provision for a supply for Skegness and Mablethorpe, it was pointed out that if Boston could give a supply Mr. Matthews was quite willing to enter into a contract with the Boston & District Electric Supply Co., Ltd.

Dr. Ekström, giving evidence in support of Mr. Matthews's scheme, said that he had allowed for step-up transformer plant, but not for generating plant at the power stations. The cable allowed for was according to the Regulations of the Commissioners. This was the first experience he had had of the practice of the British Electricity Commissioners, and he added that he had not reckoned on a certain number of services being carried underground. Regarding his intention to carry the cable down one side of a village street, and across the street to those who required service on the other side, he admitted that if the carrying of the cable underground was made compulsory it would make a certain difference to the amount he had allowed in his estimates.

Continuing his evidence on November 23rd, Dr. Ekström said the area required for a 25-kVA sub-station would be two square yards. The sub-stations would be on poles or in kiosks. The size of the larger sub-stations would be four square yards, and he considered that £50 would not be necessary to pay for that surface, as had been suggested. He had based his estimates according to English prices. Asked as to what the attitude of the villagers would be to the scheme, he remarked that he was of the opinion that 60 per cent. would agree to use electricity; this estimate was an "experience" figure rather than a calculation. He had assumed that if the Order was granted it would be operative by the middle of next year; he then expected that the actual work of the company would commence on January 1st, 1930, thus giving it six months in which to make the necessary arrangements. The number of consumers he had estimated for would be 4,200 in the first year, which number would be doubled and trebled in the two succeeding years.

Mr. John Kennedy, consulting engineer, said overhead distribution was the only way by which electricity could be supplied at an economic price; he had checked Dr. Ekström's calculations and estimates and found them fully justified for English conditions.

Mr. Borlase Matthews said it was required that the present scheme should have sufficient area over which to spread the overhead charges. Farmers using the supply would be charged 4s. 6d. an acre and 1d. per kWh, and that would not be restrictive to the use of electricity. No contract had been entered into at Skegness, but he was prepared to give an immediate supply. He had made private arrangements for £200,000, which was more than sufficient to support the scheme for two years.

Lord Heneage, chairman of the Lindsey County Council, stated that having received satisfactory assurances and support from the bank, the Council was prepared to support Mr. Matthews's scheme for the county.

Mr. L. O. Need, town clerk of Lincoln, said the Corporation had not had an application before the Commissioners since 1920, and had not been able to afford to extend its supply to rural districts. There were many areas immediately

adjoining the city boundary developing rapidly owing to proximity of the city. He saw that it was proposed to furnish supplies in the fringe areas, and so long as supplies were taken in bulk from Lincoln generating station the Corporation was satisfied.

Concluding evidence was given on November 24th.

Mr. S. G. TURNER, for the Boston and District Electric Supply Co., Ltd., said that the area for which he was applying formed a natural and proper extension to the area for which the company already served.

Mr. Craig Henderson, K.C., on behalf of Mr. R. BORLASE MATTHEWS, stated that it would be folly to sever the county. As far as Skegness was concerned, early arrangements could be made to give a supply there.

Mr. W. P. DONALD, in urging the claims of the Yorkshire Electric Power Co., said his company was more favourably placed than anybody else to give a quick and cheap service in the north-west of Lincolnshire. A point had been made that if his application were granted, a portion of the north would be left unprovided for, but if his company succeeded in obtaining the order it would be willing to include Caistor and that neighbourhood, leaving Mr. Matthews to provide for other parts of the county.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

The Patent Office and Perpetual Motion.

Let us be fair, even to a Government department.

In 1924 the Patent Office refused a patent for a perpetual-motion machine upon the ground, among others, that patents for things of no practical value and no practical use were mischievous to the State. The Law Officer, on appeal, granted the patent.

So when you say of the Patent Office staff in your leading article of November 23rd that "apparently to pass judgment on the practicability of a device is not part of its duty," your readers should understand that this view of its duty is imposed upon the Patent Office by the Law Officers of the Crown.

And those who have had experience of the casual way in which the armchair critics in foreign Patent Offices refuse patents for substantial contributions to industry as either being obvious or offering no technical advance, will not be unlikely to agree with the basis of the Law Officer's decision which he expressed in the sentences, "while I am mindful of the inconvenience which might ensue by the granting of patents in frivolous cases, . . . I think that the danger of the Comptroller or myself arrogating the power to exclude what, on the face of it, is an alleged invention which satisfies the Statute, merely on some theory of mechanics or science which may ultimately prove to be fallacious, is far more objectionable. There are many inventions to-day of great utility; wireless telegraphy may be one, processes depending on radio activity may produce others, which might possibly have been excluded from patent rights if the doctrine laid down by the Comptroller in this case were to be pushed too far."

Patent Agent.

London, *November 24th*, 1928.

[It was our intention not to reproach the Patent Office staff for the limitation of its duties, but, on the contrary, to indicate that such limitation existed—hence it was not to blame for the issue of the patent. But we were sorry to see the name of a patent agent appended to the document.—EDS. ELEC. REV.]

Electromagnetic Forces.

The influential position of Mr. E. B. Wedmore, who controls an annual expenditure of about £25,000 on research work, may make some of your readers inclined to think that the case must be as stated by him in your current issue. As this idea might cause their electrical designs to be inferior to those of their foreign rivals, I hope you can allow me to contradict what Mr. Wedmore and Mr. Trencham have said.

On p. 236 of their book, it is stated that the maximum force due to the peak value of a sinusoidal current of 10,000 amperes (root-mean-square) in each of two parallel conductors having a distance of one foot between their axes, is 18 pounds per foot run; and the reader is there reminded that the force will vary inversely as the distance between the conductors and directly as the product of their currents. The 18 is arrived at by doubling the 9 that the authors had given for a direct current of 10,000 amperes.

When this rule is applied to the case in which each conductor has a length of 1 foot and carries a sinusoidal current of 100,000 amperes, with a distance of 3 feet from axis to axis, it tells us that the maximum force is $(18\times10^3)/3$ or 600 pounds. But when we apply my formula, the proof of which was published in England last November and in France last May and has never been disputed by any British or foreign engineer, we find that the number of pounds is only 9×10^3 $(\sqrt{10/9}-1)$, which is less than 50. Here, then, without my "b in the numerator" to which they object, their rule is shown to give more than twelve times the actual force.

Since reading my article on this matter, they have proposed to amend their rule by changing the 18 to 9, thus making it agree exactly with the one in the American *Standard Handbook for Electrical Engineers*. But, as shown by the above example, even this amended rule will frequently give results that are wrong by several hundreds per cent. The rule is fundamentally bad, owing to the fact that the force "per foot run" will vary with the length of the conductors. This important fact was overlooked in the *Standard Handbook* as well as in Wedmore & Trencham's *Switchgear*; but it is duly taken into account in my formula, which consequently holds good in every case.

The authors' remarks on the circuit-breaker crossbar show a curious misconception on their part. If their rule held good in other cases, it would likewise hold good when one of the parallel conductors was a circuit-breaker crossbar, just as my formula does. As remarked by me in your issue dated September 28th, we should then have to calculate the additional force due to the other conductors; and I there gave a formula for doing this, to replace the misleading formulæ that are usually employed.

When Mr. Wedmore and Mr. Trencham say I am "heresy hunting," they make use of words that are even more wrong than their rules. A man who draws attention to errors in the orthodox teaching, which is what I have done in this case and in others, is certainly not a heresy hunter. He is, on the contrary, a heretic.

W. F. Dunton.

Manchester, *November 24th*, 1928.

Does it Pay to Acquire Knowledge?

The remuneration of technical engineers is once more brought into the limelight by two advertisements which appeared practically side by side in the November 16th issue of the ELECTRICAL REVIEW. One offers a post as switchboard attendant at £4 2s. per week. The other offers posts as technical assistants—degree essential, also workshop experience—at a rate which works out at £4 7s. 3½d. per week. Obviously, therefore, a degree is worth 5s. 3½d. per week. It should be mentioned that this post is in a Government department, but is non-pensionable. As a humorous writer in one of our great daily papers says—"Moral: Whatever you like."

P. M.

Reorganisation and Staff Displacement.

The communication in your issue of the 23rd instant from Y.Z. upon the above subject is one which will engender a large measure of sympathy amongst those engaged in the electricity supply industry, particularly so far as it emphasises the necessity of the whole-hearted co-operation and assistance of all on behalf of such engineers as may be displaced, consequent upon the operations of the schemes of the Central Electricity Board, in the endeavour of such engineers to secure other positions in the industry. Your correspondent, however, is a little critical in what he declares to be the official attitude of the E.P.E.A., and apparently assumes that this Association has waited until the present time before it has given any consideration to this important problem. Most of your readers, however, will be aware of the activities of the E.P.E.A. right from the introduction of the Electricity (Supply) Bill in May, 1919, and our justification for a large measure of credit for the Compensation Clauses in that measure, and also the subsequent Acts of 1922 and 1926, not to mention the many Private Acts which have been passed subsequently in which we have been able to secure the inclusion of suitable clauses in reference to the Compensation Clauses of the principal Acts.

May I also refer to the Central Displacement Committees which have been set up the National Joint Board to deal with the problems visualised by your correspondent, a step suggested, in the first instance, by the E.P.E.A.

With your correspondent, we would extend our congratulations to Mr. Bache for his very valuable support to the work of this Committee and for his eminently practical suggestions for dealing with the problem; it is hoped that whole-hearted co-operation towards the solution of this problem will be forthcoming, not only from chief engineers, but also from electricity committees and boards of directors, as well as from members of the technical staffs of the various undertakings. The consideration of such a problem, however, would be incomplete without a reference to the responsibilities of the displaced engineers towards its solution, and I would like to take this opportunity of emphasising that these responsibilities are as great as, if not greater than, those which attach to the managements of the various undertakings. The schemes of the Central Electricity Board do not as a rule operate in the guillotine fashion, but, generally speaking, the possibilities of a particular generating station being closed down are evidenced for a considerable period prior to the actual closing down, and during this period time is given for any engineer to prepare himself to a certain extent against the contingency of being one of the displaced staff. It is naturally expected that all such engineers, but particularly the younger engineers, to whom such opportunities are greater,

will make the most of the opportunities which present themselves from time to time, in securing knowledge and experience of other departments of the industry, such as the distribution and sales sides. As an illustration, and to give point to my remarks, I would mention that the London Group of the Technical Groups of this Association recently held a discussion that was very much *apropos* of this problem, *viz.*, the question of a.c. *versus* d.c. distribution. It was rather significant to note that the majority of engineers present at such a valuable and informative discussion were those at present connected with distribution departments, whilst the engineers whose tenure of employment is to a certain extent challenged, were somewhat conspicuous by their absence.

To revert to the E.P.E.A., I would again remark that the present position has been visualised by the Association right from the very early days. We consider that we have, as far as humanly possible, safeguarded the interests of such staffs by the Compensation Clauses which are contained in the various Acts of Parliament, and we have endeavoured, and are still endeavouring, particularly through the Central and Area Displacement Committees of the National Joint Board on the one hand, and the work of the Technical Groups on the other, to cater for the several aspects of this problem.

W. Arthur Jones,
General Secretary,
ELECTRICAL POWER ENGINEERS' ASSOCIATION.

London, *November 26th*, 1928.

Hot Spots in Transformers.

I have read the letters on this subject with much interest, although they try to explain too much. In the first place, Mr. Norris objected to an advertisement which stated that the Hackbridge Company avoided hot spots in making their transformers, and so did not need hot-spot indicators. Surely that is a commendable ideal, and the term "hot spot" is well known in the industry. Personally, I should purchase only transformers without hot spots, just as I should purchase a car with a sound chassis rather than one with "weak spots" and dashboard gaugets indicating how far it could safely be used.

Although the advertisement is perfectly clear, Mr. Norris goes on to say: "It is better to talk of hottest spots" and also talks of "safe load indicators." But this substitution of terms is not argument; it is comic opera. I consider the Hackbridge Company have made a mistake in endeavouring to resist all Mr. Norris's statements. He has made an attack on an advertisement of theirs with plain terms and meaning, and they should call upon him to substantiate his objection (which so far he has failed to do) using those same terms.

Northerner.

November 23rd, 1928.

[Several letters have been received too late for insertion in this issue.—EDS. ELEC. REV.]

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged and all subsequent proceedings will be taken.

1927.

14,539. "Process and apparatus for producing rapidly moving electrons and for subjecting matter thereto." H. E. Potts (H. Plauson). May 30th, 1927. (299,735.)

14,774. "Heating vessels by electricity." J. Parkinson. June 30th, 1927. (299,818.)

17,368. "Method for the electrodeposition of rubber of homologous substances." W. A. Williams. June 30th, 1927. (299,738.)

17,861. "Acoustic devices." M. Trouton. July 2nd, 1927. (299,822.)

18,207. "Methods of, and apparatus for, controlling electrically-operated windlasses." R. Eck and F. A. R. Gabel. July 8th, 1927. (299,488.)

18,309. "Galvanic cells." P. Porscke. July 8th, 1927 (299,591.)

19 819 "Electrical mascots and toys" O. Wild. July 26th, 1927. (299,742.)

19,932. "Sound-reproducing records." British Thomson-Houston Co., Ltd., H. N Sporborg, A. P Young, and A. T. Ward. July 27th, 1927. (299,752.)

20,200. "Intercommunication telephone systems." W. C. Davey. July 29th, 1927 (299,823.)

20,256. "Apparatus for measuring electric currents." A. Reyrolle & Co., Ltd., and H. W Clothier. July 30th, 1927. (299,749.)

20,486. "Feeding of thermionic valves from a source of current containing disturbing components." Siemens & Halske Akt. Ges. August 4th, 1928. (275,624.)

20,494. "Device for obtaining a sliding tariff, particularly on electricity prepayment meters." Landis & Gyr Soc. Anon. August 7th, 1926. (275,628.)

20,514. "Insulating material." British Thomson-Houston Co., Ltd., H. W. H. Warren, R. I. Martin, and A. E. Smith. August 3rd, 1927. (299,906.)

20,540. "Electric oil-break switches." Reyrolle & Co., Ltd., A. W. Anderson, and N. Cooke. Aug st 4th, 1927 (299,907.)

20,599. "Synchronous electric motor." Schneider et Cie. November 17th, 1926. (280,858.)

20,605. "Thermionic valve circuits." W. C. De Tanner. August 4th, 1927. (299,908.)

20,660. "Electric inductance coils." P. O. James. August 5th, 1927. (299,914.)

20,671. "Secret signalling systems." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). August 5th, 1927. (299,915.)

20,672. "Telephone and like signalling systems." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). August 5th, 1927. (299,916.)

20,695. "Glareless lamps." J M. Stewart. August 5th, 1927. (299,917.)

20,884. "Screens or filters for high power lights." W. E. Evans (R. F. H. Suhr). August 8th, 1927. (299,922.)

21,115. "Devices for taking-up slack inflexible elements, such as electric leads, cords and the like." A. Willmore and H. O. Purchase. August 10th, 1927. (Cognate application, 32,164/27.) (299,927.)

21,313. "Gasfilled incandescent cathode dischnrge tubes." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). August 12th, 1927. (299,931.)

22,044. "Electric waffle-irons." British Thomson-Houston Co., Ltd. August 23rd, 1926. (276,365.)

22,497. "System for making electrical measurements in direct-current circuits." Instrumenti Di Misura C.G.S. Soc. Anon. August 26th, 1926. (276,689.)

23,385. "Sealing of gas chambers entered by electric conductors carrying high-tension current" S. Robson. September 6th, 1927. (299,946.)

24,167. "Key-senders in automatic and semi-automatic telephone systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. September 14th, 1927. (299,955.)

24,802. "Telephone systems." Siemens Bros. & Co., Ltd., D. A. Christian, and D. P. Long. September 21st, 1927. (299,959.)

25,548. "Electric lifts." A. A. G. Jensen and W. Wadsworth & Sons, Ltd. September 28th, 1927. (299,967.)

25,561. "Devices for testing and locating the defective insulators in electric power lines." T. D. Berry. September 28th, 1927. (299,968.)

25,810. "Method of, and means for illuminating direction-signalling and other indicating devices for motor vehicles." H. Hibbert. March 13th, 1926 (299,971.)

26,404. "Junction boxes for use in electrical wiring systems." H. F McLoughlin. October 6th, 1927. (299,978.)

26,912. "Insulated electric cables and the like." R. F. Bruce and Saxonia Electrical Wire Co., Ltd. October 11th, 1927. (299,982.)

28,332. "Electric lamp bracket fittings." S. W. Hamlyn. October 25th 1927. (300,000.)

28,703. "Electric batteries." H. Hitchen. October 28th, 1927. (300,003.)

28,734. "Manufacture of coke and electrodes therefrom, chiefly for use in electrometallurgy." Soc. Anon. D'Ougree-Marihaye. August 9th, 1927 (295,314.)

29,268. "Method of protecting transformers, choking coils, switches, motors, generators, and other electrical apparatus." M. Buchholz. November 2nd, 1926. (280,209.)

29,360. "Electric coupling elements." General Electric Co., Ltd., and F. G Quance. November 3rd, 1927. (300,005.)

30,197. "Electron-emitting cathodes." Radiotechnique. November 29th, 1926 (281,262.)

30,710. "Accumulators." Soc. Anon. Le Carbone. June 4th, 1927. (Addition to 230,307.) (291,420.)

32,465. "Brake construction." Warner Electric Brake Corporation December 22nd, 1926. (282,646.)

34,638. "Construction of electroplating vats or troughs." K. Baranowski. December 21st, 1927. (300,038.)

1928.

245. "Fastening of electrical leads or wires." E. Hanff. January 4th, 1928. (300,042.)

343. "Electroplating with chromium or the electrodeposition of chromium." E V. Haves Gratze. January 5th, 1928. (300,043.)

2,452. "Electrical connections for carbon brushes." H. Ringsdorff. January 25th. 1928 (300,050.)

3,331. "Electric hoisting gear of the single-drum type, with concentric, compact, and weatherproof assembly." Etablissements Tourtellier. December 13th, 1927. (300,053.)

4,047. "Manufacture of light-diffusing glass" General Electric Co., Ltd. March 24th, 1927. (287,545.)

5,586. "Preparation of organic articles for electrolytically covering them with a metallic layer." I. Amstein. February 22nd, 1928. (300,060.)

6,887. "Controllers for electric motors." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). March 5th, 1928. (300,064.)

10,706. "Protective devices for electric circuits." International General Electric Co., Inc. April 23rd, 1927. (289,066.)

12,428. "Electrical measuring instruments for alternating-current circuits." Metropolitan-Vickers Electrical Co., Ltd. April 29th, 1927. (Addition to 227,104.) (289,481.)

14,392. "Cascade-connected asynchronous electrical machines." Forges and Ateliers de Constructions Electriques de Jeumont. June 23rd, 1927. (292,583.)

18,663. "Radio coupling devices and conductors therefor." Westinghouse Electric and Manufacturing Co. July 15th, 1927. (293,861.)

21,917. "Thermionic valve circuits for wireless reception." M. Von Ardenne. August 6th, 1927. (295,027.)

21,975. "Means for the suppression of backfires in mercury-vapour rectifiers." Akt. Ges. Brown, Boveri et Cie. August 8th, 1927. (Addition to 276,650.) (295,277.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from November 21st:—

Audiovisor. No. 488,795. All goods in Class 8.—Radiovisor, Ltd., 26, Church Street, Cambridge Circus, W.C.2.

Thermatron. No 494,021. Class 8. Apparatus and instruments for use in radio-telegraphy and telephony and parts thereof.—A. E. W. Finch, 22 Swinburne Avenue, Manor Park, E 12.

Elecson. No 496,046. Class 8. Apparatus and parts thereof for use in radio-telephony and telegraphy &c.—La Société Elecson Paris. (British representatives: Herbert Haddan & Co., 31-32, Bedford Street, Strand, W.C.2.)

Everlite (lettering and design.). No. 494,416 Class 13. Lamps (ordinary).—Metropole Gramophone Co., Ltd., Metropole House Bunbury Square, E.C.2.

Perlique. No. 495,181. Class 15. Glassware.—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

P.O. Electric Vans.

The announcement that the Post Office is to run experimentally small fleets of electric vans in London and Leeds to be used mainly for parcel delivery work in congested traffic areas was made recently by Mr. F. Lane in a paper he read before the Institute of Transport in London. This step, moreover, is being taken with the knowledge that to obtain the best economic advantages from electric vehicles it is necessary to operate them in relatively large groups. The experiment is being undertaken largely on account of the success which a similar experiment has met with in Germany.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

AYLESBURY.—Electric lighting and power installation, new county offices, for Bucks. C.C.; C. H. Riley, county architect.

BARNES (Surrey).—Bank, Ranelagh Gardens; Ebenezer King, Ltd., builders, 23, Whitefriars Street, E.C. Extensions, Optic Works; H. C. Ryland & Son. Houses (35), Clydesdale Gardens; C. S. Banks, architect, Oakfield Road, Croydon.

BEXHILL.—Waterworks (£15,000); H. Rofe & Son, consulting engineers.

BLACKHALL (Co. Durham).—Hall, &c. (£14,000), for the Miners' Welfare Committee; James Young, secretary, 4, Seventh Street.

BRADFORD.—Alterations and additions to offices for Great Horton Industrial Society, Ltd.; B. D. Fairbank and Sons, architects, Hallfield Chambers.

BRAINTREE.—Houses (100), for the Silver End Development Co.

BRIGG.—Elementary school at Redbourne (deposit £2 2s.); Scorer, Gamble & Co., architects, Bank Chambers, Lincoln.

BROADSTAIRS.—Concert hall (£8,000), for the U.D.C.; surveyor.

BURY ST. EDMUNDS.—Cinema, Butter Market; Douglas F. Bostock. Schools (£20,000), for the Borough E.C.; director of education.

CHATHAM.—Extensions, county school for girls, for Kent E.C.; W. H. Robinson, architect, Sessions House, Maidstone (returnable deposit of £2 2s.).

CHEADLE.—Elementary school; Cheshire Education Committee.

COVENTRY.—Nurses' home, Gulson Road Hospital (£27,650), for the B.G.; Hallam & Co., builders.

CROYDON.—Buildings, Purley Way; Carter, Paterson & Co.

DERBY.—Sunday schools (£10,000), for King Street Wesleyan trustees; secretary.

DURHAM.—Houses and flats for the T.C.; J. W. Green, city engineer (returnable deposit of £2 2s.).

ELLESMERE PORT.—Elementary school, Chester Road; Cheshire Education Committee.

EPSOM.—Three villas, Manor Asylum (£48,000); L.C.C.

FAREHAM.—Senior school for girls.—Hampshire Education Committee.

FARNBOROUGH.—Secondary school; Hampshire Education Committee.

FARNHAM.—Extensions, Trimmers Cottage Hospital, Stokes Hill; trustees. Development, Snailslynch Building Estate; Farnham Flint, Gravel & Sand Co.

GLASGOW.—Alterations to premises at Yoker for Clyde Valley Electrical Power Co.; the manager. Warehouse in Sauchiehall Street; C. & A. Modes, 53, New Broad Street, London. 1,000 houses for Corporation Housing Department. Tenements and shops, Saracen Street and Balmore Road; housing director.

GLOUCESTER.—Church for Brunswick Road Baptist trustees; C. A. Bretherton, secretary.

GRAYS.—Extensions and hostel, Palmers Endowed School (£9,250); Essex county architect.

HALESOWEN.—Engineering works for Stewarts & Lloyds, Ltd.; Edward Wood & Co., Ltd., structural engineering contractors, Manchester.

HALTON.—School (£6,600), for Bucks. E.C.; director of education, Aylesbury.

HARPENDEN.—Theatre, with electric lighting and heating work; Capt. Webb, Victoria Theatre.

HAYES.—Houses (500), Wood Green Farm Estate; Allied Building Corporation, Newport, Mon.

HEMEL HEMPSTEAD.—Housing scheme (80), for the T.C.; borough surveyor. Extensions, printing works, Bury Mill End, for Needham & Co.

IRISH FREE STATE (Clonskeagh, Co. Dublin).—Installation of electric bells at the Isolation Hospital for the Rathmines and Pembroke Joint Hospital Board; secretary to the Board, Town Hall, Rathmines.

KENILWORTH.—Elementary school; Warwickshire Education Committee.

KINGSTON-ON-THAMES.—Electric light installation, Central Children's Homes, New Malden, for the B.G.; W. Taylor, clerk. (November 29th.)

LEYBOURNE.—Adaptation, Leybourne Grange Mansion for mental hospital; Kent C.C.

LINCOLN.—School, Skellingthorpe Road, for the City E.C.; R. C. Minton, director of education.

LINLITHGOW.—Cinema, tea lounge, dance hall, and shops for Palace Picture Theatre (Linlithgow), Ltd. (£25,000); J. R. McKay, architect, Edinburgh.

LONDON (Leyton, E.).—School, Canterbury Road; J. H. Jacques, architect, 61, West Ham Lane, Stratford (returnable deposit, £2).

(Catford, S.E.).—30 houses, Grierson Road; Sutton & Benstead.

(Lambeth, S.E.).—Block of tenements, China Walk; A. T. Rowley, for L.C.C.

(Lewisham, S.E.).—Extensions, Lewis Grove, for Dubois, Ltd. Extension of glass manufactory, for Guardax Safety Glass, Ltd., 11-12, Finsbury Square, E.C.3.

(Lee, S.E.).—Remodelling Baring Road Schools (£7,965); F. R. Hipperson, builder, Broad Place, E.C.

(Fulham, S.W.).—Cinema and shops, Fulham Road; Yates, Cook & Derbyshire. Additions, Peugeot Motor Works, Filmer Road; J. Yellen & Son.

(Shepherd's Bush, W.).—Restoration of St. Stephen's Church (about £20,000); vicar.

LYME REGIS.—Houses (24) for the T.C. on Colway Mead site; Ramsey & Co., contractors, Willesden.

MANSFIELD.—Dairy (£12,000), for the Co-operative Society; Vallance & Westwick, architects, White Hart Street; Rogers & Crookes, builders, Victoria Street.

NETHERNE.—Extensions, Mental Hospital, for 600 patients, for Surrey C.C.; clerk.

NORTHAMPTON.—Extensions, 'bus garage, for the T.C.; Alfred Fidler, borough engineer (returnable deposit of £2 2s.).

NUNEATON.—Technical school; Warwickshire Education Committee.

OLDHAM.—Church of England; vicar of St. Matthew's and St. Aidan's Church.

OXFORD.—Mental hospital, Dorchester; Joint Hospital Committee. Development of estate, Horspath Road, Cowley; G. H. Griffiths, architect, Cardiff.

PENRITH.—58 houses, West Lane Estate; U.D.C. surveyor.

POYNTON.—Elementary school; Cheshire Education Committee.

RALEIGH.—Extensions, elementary school (£9,000); Essex county architect.

RUGBY.—Clinic hospital of St. Cross; governors. Elementary school; Warwickshire Education Committee.

RYDE.—Housing scheme (20), for the T.C.; borough surveyor.

SEDGLEY.—Workshop, Tipton Street; D. J. Price.

SLOUGH.—Cinema (£40,000); E. T. Bowyer.

SOUTHEND-ON-SEA.—Extensions, Victoria Hospital, with electrical department (£150,000); H. Percy Adams, architect, 7, Knightsbridge, London, S.W. Tramway offices for the T.C.; Robert H. Dyer, borough engineer (returnable deposit of £2).

SOUTHWICK (Sussex).—Re-erection of yacht building works, Railway Street, for Courtney & Birketts, Ltd. Houses and flats (48), for the U.D.C.; surveyor.

SPENBOROUGH.—Library; J. G. Mowat, Kenmore, Cleckheaton (donor).

STRATFORD-ON-AVON.—High school; Warwickshire Education Committee.

TILBURY.—Catholic schools (£4,000), Mr. MacDonald, architect, Chelmsford; J. McGran, builder.

TORQUAY.—School, Barton, for the Borough E.C.; Bernard Widdows, architect, St. James' Chambers, Derby (returnable deposit of £1 1s.).

TROON.—Public hall (£4,500), for the Co-operative Society; secretary.

WAKEFIELD.—Extensions, Casing shop, Calder Vale Road; E. Green & Son. Additions, Fotherby & Co.'s foundry, Legh Street; W. H. Ogden. Welfare centre, Margaret Street; city engineer.

WALSALL.—Additional 60 houses for the R.D.C.; surveyor.

WARWICK.—Extensions, County Offices, Militia Barrack site (£22,500); E. Crowder, Handsworth, Birmingham.

WEST RIDING.—Smallpox accommodation; county architect. Extensions, Mitchell Memorial Home (£5,000); County Health Committee.

WEYMOUTH.—Senior school; Education Committee.

WHITEHAVEN.—Extensions, Auction Mart; R. Bentley and Sons, architects, 53, Church Street.

WINDSOR.—Schools, with lighting and heating work, for the Borough E.C.; Leathart & Granger, architects.